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LATE NEWS

Tucson Electric Power Co. received an annual base rate hike of about $71 million, increasing revenues by 15 percent. A judge granted a third extension, to Nov. 26, to complete a restructuring plan and avoid a forced bankruptcy filing. If TE enters bankruptcy protection before '93, or if petitions from six creditors to force TE to file aren't withdrawn by '92, TE must refund the rate hike.

Wind-fallen power lines were at least partially to blame for fires in western states (WA, ID, MT, OR) that destroyed over 100 homes.

Detroit Edison named '91 Utility of the Year

BARRINGTON, IL—*Electric Light & Power* magazine named Detroit Edison the 1991 Electric Utility of the Year. The company was selected for its outstanding financial performance, excellence in operating utility facilities, and positive steps toward ensuring future strengths for customers, shareholders and employees.

"After the Fermi-2 rate settlement, Detroit Edison might have coasted into the mid-1990s," explained Robert A. Lincicome, Editor-in-Chief. "The utility chose instead to identify and capitalize upon additional opportunities."

Special report p. 13

John E. Lobbia, chairman, president and CEO, gladly accepted the honor on behalf of all employees, and encouraged their continued efforts.

"We're really proud of the job the Detroit Edison team has done. But we're not done yet."

Lobbia explained that DE's 1990 results included record revenues, near-record sales and record earnings for common stock with a 23-percent increase in earnings. Fuel and other power supply costs fell, significant improvements of power delivery reliability continued, and efficiency climbed as DE delivered more electricity to more customers with 14 percent fewer employees than three years ago.

Lincicome pointed out that DE also appeared among the top 10 in heat rate in the "Top 100 Operating Performance" and among the top 20 in "Top 100 Financial Performance," exclusive *EL&P* reports. Another DE accomplishment has been significant changes to its "corporate culture."

The *EL&P* editorial staff chose DE for the 23rd annual award after an extensive review of the investor-owned segment of the electric utility industry.

Dayton Power & Light Co. and Duquesne Light Co. were also nominated as finalists in this year's competition in what Lincicome characterized as "an extremely close selection process."

Pittsburgh, PA-based Duquesne Light was cited for economic development of its service territory, and turning modest sales and revenue increases into significant earnings per share gains. Also impressive were plans to restart two existing plants, sell 500 MW to General Public Utilities, and jointly build a new 200-mile transmission line.

DP&L's performance has shown consistant operational excellence, especially in equivalent availability and heat rate. DP&L was one of three owners to bring the Zimmer Station on line, the first nuclear-to-coal conversion, on time and under budget, Lincicome noted. It also received a presidential award for involvement with education.

After a severe July storm, Detroit Edison's John Lobbia talks about present and planned reliability upgrades with a few of 700,000 affected customers. Lobbia, chairman, president and CEO, asks that all DE executives meet with customers regularly. Most visits are under more favorable circumstances.

Electric Utility of the Year 1969-1991

1991	**Detroit Edison**
1990	**Pennsylvania Power & Light**
1989	**PacifiCorp**
1988	**General Public Utilities**
1987	**Consumers Power**
1986	**Minnesota Power**
1985	**South Carolina E&G**
1984	**Potomac Electric**
1983	**Oklahoma Gas & Electric**
1982	**Wisconsin Electric Power**
1981	**Atlantic Electric**
1980	**Boston Edison**
1979	**New England Electric**
1978	**Southwestern P.S.**
1977	**Duke Power**
1976	**Tampa Electric**
1975	**Southern Calif. Edison**
1974	**Florida Power & Light**
1973	**Carolina Power & Light**
1972	**Northern States Power**
1971	**Virginia Electric & Power**
1970	**Florida Power Corp.**
1969	**Sierra Pacific Power**

Conference & exhibition sets records

IEEE/PES technology show, sessions cover wide areas in power delivery

H. Wayne Beaty, Senior Editor T/D
Mark T. Hoske, News Editor

DALLAS—Record attendance, 450 exhibits showing the latest in power delivery equipment and related technologies, 77 technical sessions, and 7 inspection tours were among the highlights of the 12th IEEE/PES T&D Conference and Exhibition.

Some 14,061 utility engineers, manufacturers and suppliers attended the record-breaking meeting, which is held every 30 months. Over 1600 international visitors from 45 countries were in attendance—also a record for this meeting. The conference, held here Sept. 22-27, was titled "T and D: New Technological Frontiers."

The opening panel of utility executives and resulting discussions and debate covered increased utility competition, possible industry restructuring, and changing industry attitudes. Transmission access; efficiency; public concerns about EMF, transmission siting; the need for better, more reliable service; and electric technologies were among other topics addressed. Audience uestions brought reponses to other conerns, including glob warming and prosects for renewed nuear plant orders.

The opening panel was moderated by Harold Scherer Jr., president and chief operating officer of Commonwealth Electric Co. and also president of the Power Engineering Society (PES) of the Institute of Electrical and Electronic Engineers (IEEE).

Charles F. Clark, assistant administrator for engineering, Bonneville Power Administration, said, "With transmission lines at or near their capacity, we must look for regional ways to solve our power problems. Traditional methods may no longer be viable and we must consider all alternatives." Clark said utilities could advance reliability through greater cooperation and sharing more system data.

Clark further stated that due to public concerns about environment and effects of electric and magnetic field expo-

Continued on page 24

A few of the record-breaking 14,000 attendees view exhibits at the 12th IEEE/PES T&D Conference and Exhibition. Some 450 exhibitors displayed the latest in T&D products and services for the electric utility industry. Over 1600 international visitors from 45 countries attended the five-day meeting.

NEWS BRIEFS

JILL MINNER, Special Projects Editor

BPA pays over $600M to U.S. Treasury

The Bonneville Power Administration (BPA) said its payment to the U.S. Treasury for fiscal 1991 totalled over $601 million. The breakdown of BPA's payment is: $317 million in interest, $176 million to amortize this year's portion of the principal, and $108 million for U.S. Army Corps and Bureau of Reclamation operation and maintenance of federal dams.

According to BPA, this is the eighth consecutive year it has paid the Treasury more than $600 million. BPA's total Treasury payments amount to more than $5.5 billion in interest and $1.8 billion in principal payments.

GE to help WPPSS boost plant output

Washington Public Power Supply System (WPPSS) has approved two contracts with General Electric Co. (GE) to increase the power output and reliability of the utility's 1100-MW WNP plant.

The first project involves a three-year program in which GE will redefine the operating limits on all plant systems and equipment. Cost of the project, which is being funded by the Bonneville Power Administration, is estimated at $18.3-$25.7 million, said the utility.

Under the second contract, GE will design adjustable-speed drives for two recirculation pump motors and provide all the hardware and controls. WPPSS projects the total cost to be $10 million.

Bechtel Power Corp. will provide additional services for both projects under existing contracts.

NARUC issues utility and carrier reg report

The National Association of Regulatory Utility Commissioners has released its *Annual Report on Utility and Carrier Regulation*. The 1060-page report profiles over 100 federal, state and Canadian regulatory agencies, provides agency histories, and summarizes all cases considered during 1990 and early 1991. It also contains summaries of rate cases for miscellaneous utilities and carriers.

The report includes a detailed subject index, more than 500 pages of tables and charts, and a glossary of terms used in utility and carrier regulation.

A copy of the report is available for $70 from NARUC, P.O. Box 684, Washington, DC. 20044.

Siemens buys ACES

Siemens announced that Siemens KWU, the Power Generation Group of Siemens AG, Erlangen, Germany, has acquired A-C Equipment Services Corp. (ACES). ACES provides parts, services and modernization of utility and industrial steam turbines, generators, static exciters and electro-mechanical devices.

Siemens said the acquisition will enhance its service capabilities for gas and steam turbine generators.

NIPSCO laser show benefits needy

A series of laser shows were recently held at Northern Indiana Public Service Co.'s (NIPSCO) Michigan City generating station. Each one-hour show featured laser images choreographed to music and projected onto one of NIPSCO's cooling towers. Proceeds from the shows were donated to "Gift of Warmth," an energy assistance program sponsored by the utility.

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Residential electric bills last winter increased 4.8%, NARUC reports

Twelve Most Expensive Companies

Company Name	State	Avg. Cost Cents/kWh	Winter 90-91 National Rank
Kauai Electric Co.	Hawaii	$0.163	1
Nantucket Electric Co.	Massachusetts	$0.162	2
Hawaii Electric Light Co.	Hawaii	$0.157	3
Long Island Lighting Co.	New York	$0.157	4
Maui Electric Co.	Hawaii	$0.149	5
Consolidated Edison Co. of N.Y.	New York	$0.139	6
Philadelphia Electric Co.	Pennsylvania	$0.139	7
Commonwealth Electric Co.	Massachusetts	$0.138	8
Duquesne Light Co.	Pennsylvania	$0.128	9
Orange & Rockland Utilities, Inc.	New York	$0.127	10
Pennsylvania Power Co.	Pennsylvania	$0.126	11
Western Mass. Electric Co.	Massachusetts	$0.125	12

Twelve Least Expensive Companies

Company Name	State	Avg. Cost Cents/kWh	Winter 90-91 National Rank
Washington Water Power Co.	Idaho	$0.042	186
Pacific Power & Light Co.	Washington	$0.043	185
Washington Water Power Co.	Washington	$0.044	184
Idaho Power Co.	Idaho	$0.047	183
Idaho Power Co.	Oregon	$0.047	182
Portland General Elec. Co.	Oregon	$0.051	181
Potomac Electric Power Co.	Dist. of Col.	$0.052	180
Kentucky Utilities Co.	Kentucky	$0.052	179
Puget Sound Power & Light Co.	Washington	$0.054	178
Minnesota Power & Light Co.	Minnesota	$0.055	177
PacifiCorp	Oregon	$0.055	176
Utah Power & Light Co.	Wyoming	$0.056	175

Source: National Association of Regulatory Utility Commissioners

Customers' electric bills rose approximately 4.8 percent between 1990 and 1991, according to the National Association of Regulatory Utility Commissioners' (NARUC) winter survey of residential electric utility bills. During that same period, the Consumer Price Index increased 6.1 percent.

A regional comparison reveals that customer's bills in the Northeast and New England were the most expensive in the nation, while Northwest and Rocky Mountain customers had the least expensive bills (see table).

The average cost of electricity across the nation was 8.7 cents per kWh, up 0.4 cents per kWh from NARUC's 1989-90 winter survey. However, NARUC points out that as a result of current demand-side management programs, simple kilowatt hour comparisons are not always an accurate reflection of the true cost of electricity for retail customers.

Personnel briefs

Randall W. Hardy replaces James J. Jura as head of the **Bonneville Power Administration,** according to the Department of Energy. Hardy has served as CEO of **Seattle City Light** since 1984, and is president of the **American Public Power Association**. Jura is now general manager of **Associated Electric Cooperative Inc.**

Public Service Electric and Gas Co. named Lawrence R. Codey president and chief operating officer. Codey was previously senior vice president-electric. Former PSE&G President E. James Ferland remains chairman and chief executive officer.

Stanley T. Skinner was appointed president and chief operating officer of **Pacific Gas and Electric Co.** He succeeds George A. Maneatis who retired Nov. 1.

Montana Power Co. has chosen Daniel T. Berube as chief executive officer of the utility. Berube joined Montana Power as a mechanical engineer, and was most recently president and CEO of Entech.

William D. Steinmeier, chairman of the Missouri Public Service Commission, was named as the 100th president of the **National Association of Regulatory Utility Commissioners.** Steinmeier replaces William A. Badger who resigned from the Maryland Public Service Commission to become president of the **Pennsylvania Electric Association.**

Puget Power seeks bids

Puget Sound Power & Light Co. is seeking proposals from non-utility sources for new long-term energy supplies. The utility said it wants 100 to 200 MW, from either conservation or generation resources, for the 1995 to 1998 period.

Bids are due Jan. 9, 1992.

Yankee Atomic Electric closes Yankee Rowe N-plant

NRC staff prompted shutdown; modifications possible; differences in interpreting data

Yankee Atomic Electric voluntarily closed the Yankee Rowe nuclear plant on Oct. 1, prior to the scheduled April '92 outage and extensive reactor vessel tests.

On Sept. 30, Nuclear Regulatory Commission staff recommended the commission close the reactor because of concerns about core embrittlement and possible pressure vessel failure if emergency cooling occurred.

NRC staff reported that revised calculations from previous studies of core embrittlement (*EL&P*, 9/91, p.1) had increased concern about the risk.

Yankee Rowe personnel disagreed with the staff's assessment of data and met with NRC staff to discuss the findings. An NRC spokesman said the two sides differ in the interpretation of the data. The plant cannot be restarted without commission approval.

The 167-MW, 31-year-old unit has had a positive operating record, and plans were made to seek a 20-year license extension. The 40-year operating license was due to run out in 2000.

Additionally, more comprehensive tests are likely. Various modifications had been proposed to reduce risk in a partial coolant-loss accident, such as premixing emergency cooling water with hot vessel water to mitigate thermal shock to the pressure vessel.

With a current surplus of power in New England, the shutdown isn't likely to create any immediate shortage. Yankee Atomic, with a take-or-pay contract, operates the plant for 10 owners, including Northeast Utilities, New England Electric System, Boston Edison and Central Maine Power Co.

UtiliCorp acquires Centel properties

KANSAS CITY, MO—UtiliCorp United finalized the previously announced $346-million acquisition of Centel's Kansas and Colorado electric utility properties. UtiliCorp renamed the 136,000-customer areas WestPlains Energy and will operate them as a single division based in Pueblo, CO.

Final regulatory approvals came late in September from the Federal Energy Regulatory Commission and Kansas state regulators.

UtiliCorp will pay $210.5 million for electric transmission, distribution and some generation assets and will assume liabilities of about $21.3 million.

"In financial terms, this is the largest acquisition UtiliCorp has completed," said UtiliCorp Chairman President Richard C. Green Jr. "This was a very important step forward in our ongoing effort to build a larger, stronger and more competitive utility company."

The deal also involves Citibank, which paid Centel $114.6 million for 8-percent ownership interest in the 2020-MW, coal-fired Jeffrey Energy Center, near Topeka, KS. UtiliCorp will pay Citibank $10.4 million a year for 161 MW of baseload capacity over a 27.5-year operating lease.

In an unrelated transaction, UtiliCorp paid about $39 million to EnCap Financial Services Inc. for remaining ownership interest of Clajon Holdings LP, a 1200-mile intrastate gas transmission and gathering network.

UtiliCorp is seeking regulatory approval to offer as many as 5.75-million shares of stock, and plans to sell $150 million in senior notes.

The Kansas City, MO-based UtiliCorp now serves about 966,000 customers in eight states and British Columbia and has various non-regulated utility and energy-related enterprises.

NEB projects substantial growth inside Canada and for exports

CALGARY, Alberta—Canada expects to export nearly 2.5 times as much electricity in 2000 as in 1989 (see table), according to a report released Sept. 17 by the National Energy Board (NEB).

Those projections depend largely on Hydro-Quebec's expansion projects, which are being challenged on several levels (*EL&P*, 10/91, p.1).

The report, "Canadian Energy Supply and Demand 1990-2010," says Canada's electrical energy demand, excluding exports, is projected to increase 1.5 percent per year 1989-2010, increasing from 474,386 GWh to 645,586 GWh.

NEB says that even with slow growth rates, natural-gas combustion turbines and demand-side management programs, "Canada will need to rely on substantial expansion of conventional sources of electric power supply, such as hydro, coal and nuclear capacity, to meet the bulk of its electricity demand growth over the study period."

The report also includes, for the first time, projections about gases from the production and use of energy, "including those gases linked to the greenhouse effect, acid rain and low-level ozone." Emissions of carbon dioxide and nitrogen oxides are projected to increase, while volatile organic compounds and sulfur dioxide are expected to decrease, NEB said.

The 473-page report updates one published in 1988.

Copies are available from the NEB Regulatory Support Office, Cadillac Fairview Blg., 311-6th Ave. SW, Calgary, Alberta, Canada, T2P3H2; telephone 403/292-4800.

Gross Electricity Exports
(Terawatthours)*

	1989	2000	2010
New Brunswick	4.5	2.6	1.9
Quebec	5.7	22.9	26.0
Ontario	2.7	7.5	7.2
Manitoba	1.2	5.9	5.3
Saskatchewan	#	#	#
British Columbia	4.4	6.4	6.4
Canada Total	18.5	45.3	46.8

Numbers have been rounded.
*Excludes exchanges. # Less than 0.1
Source: "National Energy Board Canadian Energy Supply and Demand 1990-2010"

Air regulations due this month

WASHINGTON—The Environmental Protection Agency is expected to produce a number of final regulations late in October or in November under the Clean Air Act Amendments of 1990.

Affected areas include rules on operating permits, credits for early reductions, listing of source categories, the "WEPCo fix," and ozone nonattainment for cities.

Under the operating permits portion, participating organizations would likely be required to submit detailed emissions analyses and compliance reports to receive operating permits. The American Boiler Manufacturers Association, and others, have expressed concern about language that might require permit review for some operational changes, even if emissions remain within a permit's allowance.

The guidelines also are expected to cover credits for the early reductions needed to receive a six-year extension to use Maximum Achievable Control Technology. A 90-percent reduction was proposed by EPA for those participating.

The "WEPCo fix" is EPA's answer to the extended debate with Wisconsin Electric Power Co.

Ozone nonattainment is a guidance document for ozone, carbon monoxide, and particulate-matter regulations to come under Title 1.

The above summaries were provided by the "ABMA News" newsletter.

BPA boosts transmission and substation capacity

PORTLAND, OR—The Bonneville Power Administration will boost transmission and substation facilities to carry an additional 1800 MW to meet the Puget Sound area's energy needs through 2003.

Included will be the addition of static var compensators (SVC) at two substations—one near Renton, WA, and the other near Portland. The contract for the two SVCs, associated buildings and equipment for $45 million was the largest of its kind for Asea Brown-Boveri, who will supply the equipment.

More than 70 percent of the Puget Sound area's electricity is supplied through 150-mile long transmission lines from hydroelectric dams and power plants east of the Cascade Mountains to Seattle.

Mark Reynolds, assistant director, Electrical and Electronics Division, said, "Winter peak demand in the Puget Sound area has been growing by about 200 MW a year. These compensators will help regulate voltage. They can react to voltage dips in less than one twenty-thousandths of a second."

BPA will also add $45 million in shunt capacitors to six other substations in the Portland and Seattle areas by 1993. Four utilities—Puget Sound Power & Light, Seattle City Light, Tacoma City Light and Snohomish Public Utilities—will build a new $40-million substation north of Ellensburg, WA.

Study shows no EMF effect on sheep

PORTLAND, OR—After a 1-year study, Oregon State researchers found no effects from a 500-kV transmission line on sheep.

During the study, a group of 10 sheep were penned directly beneath the 500-kV line, where electric and magnetic fields (EMF) are strongest. A second control group of 10 sheep was kept away from the high-voltage power line at a point where levels were low.

OSU researchers took more than 6000 blood samples from the sheep over a 10-month period and tested them for fluctuations in the levels of melatonin, a hormone that regulates the body's biological cycles.

The study took place at the Bonneville Power Administration's Ostrander substation near Estacada, OR. Jack Lee, environmental health specialist for BPA, presented the preliminary findings at a recent meeting of the Bioelectromagnetics Society in Salt Lake City. "We found that both the animals under the power lines and those in the control area showed normal melatonin patterns," Lee said. "We found no significant difference between the two groups."

The findings are still under review by OSU. A final report should be available in spring 1992. Researchers are now repeating the study, using two new groups, each of 15 sheep. The larger sampling may provide smaller fluctuations in melatonin levels that may have gone unseen in the first study groups.

Congress progresses on energy legislation

WASHINGTON—Discussion, debate and hearings continue on the wide-ranging aspects of energy legislation now before Congress.

By mid-October, the Senate omnibus energy policy bill was expected to reach the floor, said Sen. Bennett Johnston (D-LA). With help from Sen. Malcolm Wallop (R-WY), Johnston has indicated the various titles will likely go in order, except for the WEPCo, which will be dropped, because of the EPA fix. Johnston hopes to deliver a bill to the administration during 1992.

Heavy debate continues on opening of the Alaska Natural Wildlife Refuge to exploration and revisions to the Public Utility Holding Co. Act. Several senators have plans to filibuster, according to the "EEI Washington Newsletter."

The House Energy & Power Subcommittee is expected to move its bill to full committee later this fall.

Watch next month's *EL&P* for comparisons of various aspects of the energy bills.

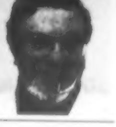
Map now available

TULSA, OK—The "*EL&P* Electric Power Generation and Transmission Systems Map of the U.S." is now available.

The 42x58-inch full-color map includes transmission lines, 230 kV and up, in five categories; investor-owned electric utility names, holding companies and service areas; utility generating facilities' names and locations, 200 MW and larger, by county, size, fuel and operator; major substation locations; and NERC boundaries.

The map sells for $65 in the U.S. and Canada; $95, export. Limited laminated quantities sell for $85 in the U.S. and Canada; $120, export. Contact PennWell Maps, P.O. Box 21288, Tulsa, OK, 74121; 1-800-752-9764.

COMMENTARY



Competitive people a must if utilities are to be competitive

A company can be no better than its people. And a company's people can be no better than its corporate culture dictates.

These may sound a bit like basics from a Management 101 course...or even truisms. In any case, they apply to electric utility organizations, and may well explain why so many electric utilities have had trouble adjusting to the realities of operations today.

Over the past decade, many electric utility organizations have turned to a plethora of non-regulated activities in an effort to be competitive on behalf of investors. Some efforts were related to utility activities, but many were not. But in both cases, a substantial number proved to be total failures; many more have produced only marginal returns. Outside the core utility business, most utilities generally have been out of their league as competitive organizations.

Now, utilities find their core businesses challenged. Becoming competitive today is a matter of corporate life or death tomorrow.

But for utilities to become more competitive, employees must develop a competitive spirit, too. Unfortunately utilities' corporate cultures aren't conducive to such development.

Competitive spirit means that employees see themselves as contributing to achievement of corporate goals. Having the team win, rather than achieving personal goals independently, is the mark of competitive spirit. Unfortunately, most utility engineers and managers operate within a strict set of guidelines directed from the top down. Individual performance determines rewards.

Very simply, the prospect for developing competitive spirit is stifled where corporate cultures dictate employees only do what they are told, perform their assigned tasks as well as they can and keep their mouths shut. Risk-taking, where the rewards depend on achieving corporate goals, is not a normal utility engineering or management function. Incentive programs, promising rewards for successful risk-taking and demonstrated initiative in group/team conduct, still are far from common.

But the industry is changing. Electric utilities have no choice but to become more competitive when confronted by non-utility generators, the prospect of some form of forced open transmission access, and commissions with broader agendas calling for least-cost solutions to energy supply problems. Companies that would not only survive, but hope to grow in this environment must change the ways they operate...internally, and externally. This means developing people at all levels who willingly accept the personal challenge to work harder and smarter, to exercise their initiative to be more effective in the performance of their jobs, to assume the risk of making decisions in the competitive marketplace, and to be rewarded in relation to their efforts' contributions to optimum corporate performance.

The task is not easy. As remarked above, utilities are not known for producing free-thinkers on the job. In fact, as consultant Joe Pohlman recently suggested, many utility employees completely lack a competitive personality. In fact, many openly admit that they sought employment in the electric utility work environment because it wasn't competitive. Changing such ingrained attitudes will be difficult.

But unless the the directors of corporate culture begins to recognize and reward team efforts, instead of individual achievements alone, and can develop employees to become more competitive, and to seek the rewards of team (or corporate) achievement, then the only alternative will be to seek help from the outside. Imported managers not only are willing to assume the risks of working competitively in return for the opportunities of moving up in the organization and improving their earning potentials, but may actually seek increased competition for its own reward. But wholesale import of outside talent creates other equally serious organizational problems.

There's no easy route. Electric utilities must become more competitive. The only realistic questions to be answered are 1) How fast can utility CEOs react to the threats they face?...and 2) To what degree will top utility managements change the corporate culture so more engineers and managers can become profit-producing, customer-satisfying members of the true corporate competitive team?

Robert A. Lincicome, Editor-in-Chief

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Papers needed for 3 meetings

Three meetings related to power delivery have issued a call for papers.

Inter-RAMQ, by Dec. 15

The Inter-RAMQ (International Reliability, Availability, Maintainability, Quality) conference is issuing a call for papers for its August 1992 meeting in Philadelphia.

The conference covers technical, economic, and management aspects of reliability and quality progams. Exhibitor displays enable participants to more fully explore the various technologies available for implementing reliability and quality programs.

The conference committee is seeking papers covering a variety of topics applied to fossil and nuclear generation, transmission, distribution, system modeling and design, manufacturing, and other energy systems.

Papers should discuss practical and innovative applications that have been used to improve system performance. The time for presenting the paper should be 20-25 min. followed by a short question and answer period.

Send a 300- to 500-word abstract no later than Dec. 15, 1991 to Dev Raheja, Technology Management Inc., 9811 Mallard Dr., Suite 213, Laurel, MD 20708; 301/792-0710.

For program and registration information contact Bob Filipovits, Pennsylvania Power & Light, 1005 Brook~~side Rd.~~, Allentown, PA 18106; 215/398-5158.

For exhibit space information contact Ed Parascos, Con Edison of NY, 4 Irving Pl., New York, NY 10003; 212/460-6681.

ICC, by Jan. 1

The IEEE/PES's Insulated Conductors Committee is issuing a call for papers for its special meeting in Birmingham, England, July 20-24, 1992. This special meeting will be held in conjunction with the Electrotech Exhibition, which is expected to attract 50,000 visitors.

This is the first ICC session out of North America. One of its objectives is to acquaint U.S., Mexican, Canadian and European wire and cable companies with each other, and to discuss wire and cable requirements.

The ICC is looking for technical papers, case histories and developmental studies addessing, but not limited to, the following topics:

- New constructions for transmission and distribution cables.
- Cable design and testing programs.
- Accessory development.
- Installation procedures and case studies.
- Operational statistics for transmission and distribution cables.
- Testing methods.
- Accelerated life testing.
- Shielding techniques.
- Control/instrumentation and communication cable designs.
- Low-smoke/zero-halogen transmission and distribution cable materials.
- Mechanical testing of finished transmission and distribution cables.
- Harmonization/globalization issues.

Send declarations of intent no later than January 1, 1992 to: Mr. Lauri Hiivala, Canada Wire & Cable, 22 Commercial Road, Toronto, ON Canada M4G 3W1; phone 416/467-4158; fax 416-421-4779.

Final manuscripts are due no later than March 1, 1992.

CIRED, before Jan. 24

The Twelfth International Conference on Electricity Distribution (CIRED) will be held at the International Conference Center, Birmingham, United Kingdom, May 17-21, 1993.

The conferences are held every two years. The papers and discussions are designed to contribute towards the advancement of the art and science of electricity distribution, in addition to providing an interchange of information and experience.

The U.S. CIRED Liaison Committee is calling for papers from the USA. Papers should emphasize technology and management practices in which the USA is considered to be the world leader. Topics should be selected from these categories: substations, disturbances and protection, cables and overhead lines, operations and control, industrial systems and consumer installations, design and planning.

Send a 500-word synopsis and a draft of the paper before Jan. 24, 1992, to: *U.S. CIRED Liaison Committee, Technical Paper Review Subcommittee, Attn: J.E.D. Northcote-Green, ABB Advanced Systems Technology, 777 Penn Center Blvd., Pittsburgh, PA 15235, ph. 412/825-9224.*

Emissions, dismantling

President George Bush at a Sept. 8 visit to the Grand Canyon National Park praised an agreement to cut, by 90 percent, SO_2 emissions from the Navajo Generating Station. C.M. Perkins, general manager of the Salt River Project, the Phoenix-based utility operator for the plant, also approved. Scrubbers will cost $430 million to construct . Operating costs over 20 years will be about $1.37 billion. The agreement follows three months of negotiations and defuses an 1982 suit the Environmental Defense fund brought against the EPA.

Illinois mandated use of scrubbers for Commonwealth Edison and Illinois Power plants to keep them burning Illinois coal, which has a high-sulfur content. The law includes up-front prudence review, authorization for construction work in progress rate treatment and grants to help offset cost of scrubbers. Changes are needed to comply with the 1995 emissions deadline.

Dismantling of Shoreham's nuclear componants continues, after challenges to keep the plant intact failed. New York Power Authority is studying conversion to a natural-gas-fired plant.

Capacity clarified

WASHINGTON—Capacity additions from the Edison Electric Institute appeared considerably lower than estimates from the North American Reliability Council in two graphics *EL&P* published in September.

EEI's "1990 Financial Review, Annual Report of Investor-Owned Electric Utilities" stated 28,882 MW capacity additions, 1990-99.

NERC's "Electricity Supply & Demand 1991-2000," cites utility additions of 71,600 MW, 1991-2000, (*EL&P*, 9/91, p.4).

Periods covered by the two graphs were different. The NERC graphic included units planned, but not authorized by the utility, as well as units with regulatory approval pending. Also, EEI numbers were actual orders, which contributed to the difference. (*EL&P*, 9/91, p.1).

The EEI graphic, named "Capacity Additions," also should have specified that the data was for utilities in the contiguous United States.

Some values were misstated. Additions by electric utilities, 1990-99, should have been 28,882 MW, not 28,879; fossil steam turbine additions in 1990-99, 9845 MW; combustion turbine additions in 1994, 674 MW; hydraulic turbine additions in 1994, zero.

Purchasing management: 'We must go further'

Exclusive survey

A significant gap is developing between purchasing departments' current efforts and potential improvements in purchasing's performance, according to the second annual survey of electric utility purchasing managers by *EL&P* and Richard Metzler and Associates (RM&A).

More than 80 percent of respondents believe that basic directions and strategies should be rethought. Three specific strategies are emerging:

1. Shift from techniques and process-related programs to an emphasis on end results (42 percent of respondents).
2. Streamline and improve organizational effectiveness (35 percent of respondents).
3. Increase operational integration inside and outside the utility (23 percent of respondents).

Respondents were purchasing managers representing all U.S. geographic regions; 26 percent of respondents were involved with power delivery purchasing, 28 percent with fossil, 16 percent nuclear, 18 percent with both nuclear and fossil, and 20 percent were involved in other types of purchasing. Nearly 40 detailed responses represent electric utilities with revenues from $100 million to $5.0 billion and an average of $1 9 billion.

Things to lose sleep over

Purchasing managers nationally presented a clear picture of three major concerns:

- Internal concerns.
- External concerns.
- Supplier relationships.

As outlined in table 1, purchasing management reports its three most important internal concerns are inventory control, lack of end-user planning, and systems/level of automation. Improved control over inventory is tied to tightening utility budgets, and driven in turn by an increasingly competitive energy market and/or continued regulatory scrutiny.

Lack of end-user planning, including outage planning, remains a chronic problem that affects inventory levels, lead times, costs, and quality. Purchasing's ability to manage costs and improve service to end users is hampered by aging systems that are less and less effective in serving the utility's evolving needs. Survey data reveal that the average age of an internally developed information system is eight years, and an externally developed system is almost four.

Purchasing's Most Important Internal Concerns (Table 1)

Issues	Respondents (%)
1. Inventory Control	25%
2. Lack of End-user Planning	14
3. Systems/Level of Automation	14
4. Staffing Levels	10
5. Span of Control	8
6. Insight into Corp Strategy	6
7. Budget	6
8. Organizational Structure	6

Source: EL&P/RM&A Survey

Table 2 defines purchasing's most significant external concerns. These are consistent with last year's survey results and reflect traditional purchasing-vendor issues.

Compared with last year's survey (*EL&P*, 9/90, p 19), this year's results indicate that supplier performance is the same or worse across four basic factors: order lead times and product quality have remained the same, prices have increased, and the level of vendor support has decreased. Profit problems in the supplier segment continue and basic service levels are deteriorating. As one respondent noted, suppliers provide "less support, have larger territories to cover, and carry smaller inventories."

Purchasing-supplier relationship

Many purchasing managers look back to a time when the utility business was simpler. One purchasing manager seemed to speak for all when he said "doing business should be fun again. The buyer and vendor shouldn't be making each other look bad."

The relationships between suppliers and purchasing departments have become more complex. As Table 3 shows, the 10 most important aspects of the purchaser-supplier relationship are both tangible and intangible.

One respondent noted that "this is a quantifiable relationship that is evaluated by the numbers. Low performance—we don't do business. However, the personal relationship I develop, trust, honesty, and a commitment to perform time and time again, is most important to me." It's interesting to note from the tables that partnering was near the bottom as a concern and as an important aspect of the relationship with suppliers.

Suppliers and buyers do not yet agree on the benefits each will receive from these "partnerships." The vendor sees it as a way of locking up requirements and a future stream of revenue. The buyer agrees only to the extent that alternative and competitive sources are unavailable. As a consequence, utilities are not yet realizing the types of benefits being gained from partnership in other industries.

Purchasing's Most Important External Concerns (Table 2)

Issues	Respondents (%)
1. Product Quality	39
2. Order Lead Times	19
3. Level of Support	11
4. Firm Pricing	10
5. # of Available Suppliers	9
6. Vendor Relations/ Partnering	5
7. Product Compatibility	3
8. International Suppliers	3

Source: EL&P/RM&A Survey

While the reasons are open to debate, in general, manufacturers have been more reliant upon lean inventories and line production than have regulated utilities and have benefitted more from "partnering." The nature of the utility grid and business traditionally grants more flexibility to compensate for a failed component and still produce and deliver power. Still, greater opportunities exist for utilities.

Current programs

Given these concerns, purchasing management has initiated a number of programs and techniques to improve its performance. These actions, outlined in Table 4, emphasize a basic programmatic approach to improving performance, examples being the pursuit of Electronic Data Interchange (EDI), quality programs, vendor partnering and formal vendor evaluation programs. These programs are the same as those identified in the previous annual *EL&P*/RM&A survey. The purpose of the programs is to address the primary concerns of purchasing management: quality, lead times and support levels.

Emerging strategies

The survey's final question asked, "Do you believe the goals and objectives of your organization should change in the future, and if so, how?"

More than 80 percent of survey respondents said the direction and strategies of the purchasing organization should be rethought. While Total Quality Management and other process-oriented programs are necessary and positive steps, they are not sufficient. Purchasing managers report that they must better manage their own organizations, and maximize contributions to the corporate bottom line. Three specific strategies emerged from their comments.

1. Shift from techniques and process-related programs to an emphasis on end results (42 percent of respondents). The advent of programs and initiatives such as total quality programs, formal vendor-utility partnerships, and other vendor evaluation programs have focused substantial attention on process. Specifically, these programs are imposing a process overlay on purchasing departments that is diluting management attention and resources away from end results. Purchasing management reports that they must implement programs and develop systems that support and measure results versus process. While a process orientation is useful, organizational focus, including process, needs to remain fixed on improving departmental performance.

10 Most Important Aspects Purchasing-Supplier Relationship
(Table 3)

Rank	Respondents (%)
1. Quality	19
2. Trust	14
3. Reliability/Performance	13
4. Cost/Pricing	13
5. Communication	12
6. Service Level	9
7. Honesty	8
8. Responsiveness	6
9. Partnering	4
10. New Designs	2

Source: EL&P/RM&A Survey

2. Streamline and improve organizational effectiveness (35 percent of respondents). Process speed, process versatility, increased information flow, full utilization of available technology and other resources, and greater creativity will be key considerations of organizational design and personnel selection.

While these characteristics are not new, they reveal a dissatisfaction with how a purchasing department functions and responds. Further organizational modification should position the purchasing organization to better respond to its changing environment, including the management of its internal and external pressures.

3. Increase the level of backward and forward operational integration; that is, improve relationships within the utility and with vendors (23 percent of respondents). Implementing an effective mechanism to link up with purchasing's internal and external constituents continues to be an issue. A cornerstone of any mechanism is to ensure common goals with these entities.

Internally, purchasing must work with engineering, end users, and operations planning to build trust among departments, actively participate in advance joint planning, and foster an understanding of total acquisition cost and the impact on the corporation.

Purchasing Actions in 1991 Ranked by Importance (Table 4)

1. Product Standardization
2. Cost Containment
3. Greater Use of Technology (EDI)
4. Implementation of Quality Program
5. Organization Change
6. Vendor Partnering
7. Increased Safety Stock
8. Formal Vendor Evaluation
9. Length/Scope of Vendor Contract

Source: EL&P/RM&A Survey

Externally, purchasing must work with multiple supplier departments, not only sales but also engineering and distribution, to accomplish much of what is required with purchasing's internal constituents. Specifically, purchasing must build an environment of trust, participate in product planning sessions, recognize the total cost of acquisition, and share in the successes and failures of the relationship.

Looking ahead

In the future, purchasing management should continue to strive to broadcast its value internally and to develop an effective relationship with key suppliers, formal or informal, on the basis of shared success and failure, the survey results suggest.

In the past, the state of the electric utility industry did not necessitate an aggressive focus on cost containment. Regulatory action was deliberate and predictable, utility costs were passed through to ratepayers with little opposition, and the supplier industry thrived in the wake of a vibrant economy and consistently healthy load growth. As a result, the purchasing department's role as a critical contributor to the health of utility operations was not recognized and perhaps was unneeded.

However, in today's environment of increasing competition, continued regulatory scrutiny, internal pressures on cost, and shrinking supplier markets, a different focus on purchasing is required. Leading utilities are beginning to recognize that 25 to 40 percent of a utility's total cash flow passes through the purchasing and contracts organizations. The potential impact of a well-organized purchasing department is beginning to be realized. Forward-looking organizations will maximize this strategic component of a utility's cost structure by assessing the effectiveness of their own purchasing programs and by pursuing the changes in purchasing strategies outlined above.

Richard J. Metzler, James R. Blomberg and Kathryn Ball of RM&A contributed to this article.

Underground Systems Inc. acquires Nitech

MILFORD, CT—Nitech Inc. has been acquired by Underground Systems Inc. (USi) of Armonk, NY. The price was not disclosed.

The acquisition includes the operating assets and ongoing business related to the Power-Donut technology and other technologies related to direct electrical measurements from high-voltage power facilities.

Nitech's new Electran product is used for substation instrumentation application. By measuring high-voltage quantities without the need for conventional dc transducers or meters, energy management and SCADA systems may be expanded to older or smaller substations.

Nitech was founded in 1985 as a joint venture between Niagara Mohawk Power Corp. and an engineering/design firm. It will continue operations at its Milford, CT, location.

USi is a privately owned corporation providing high-technology engineering services and state-of-the-art transmission/distribution monitoring equipment to electric utilities.

Clean Coal awards to work in three different areas

WASHINGTON—In its fourth round awards, on Sept. 12, the Department of Energy selected nine new Clean Coal Technology (CCT) demonstration projects with a combined value of $1.5 billion. DOE will co-fund the projects with both private companies and state governments.

Changes, but DOE is pleased

The total federal assistance sought exceeded the $568 million DOE allotted for Round IV, so the department will negotiate changes in some of the projects. The nine new CCT projects joined 33 others selected in the previous three rounds, which brought the total combined government-industry investment in the program to $4.6 billion.

Declared Secretary of Energy James D. Watkins, "Today's [Sept. 12] action moves us closer to our goal of having in place a full complement of 'showcase' demonstration plants that I believe represent the future new look of the nation's coal-fired power industry." He went on, "Many of the technologies virtually eliminate the major pollutants commonly associate with acid rain, and several offer the dual benefits of superior environmental performance coupled with more-efficient, lower-cost power generation."

Current plans call for a fifth round to be held by March 1, 1992.

IGCC projects

The nine new projects are located in eight states. In Rounds 1-4, CCT will be sponsoring 42 ventures in 22 states. Round IV awards include:

- TAMCO Power Partners, a partnership of Tampella Power Corp. and Coastal Power Production Co., will conduct an IGCC project at a new power plant to be built at a coal mine near Coeburn, VA. The integrated-gasification combined-cycle (IGCC) process will produce 107 MW, while demonstrating improved coal-to-power efficiencies and reduced costs compared to commercially available systems. It also will reduce SO_2 and NOx emissions "significantly."

Other participants will be Stone & Webster Engineering and the Institute of Gas Technology.

- Sierra Pacific Power Co. (SPPC) proposes an 80-MW IGCC plant in western Nevada through a contract with Foster Wheeler USA Corp. The MW Kellogg Co. will be the subcontractor providing the design for the KRW fluidized-bed gasification process.

The project is to demonstrate that IGCC plants can have capital costs and thermal efficiencies that will reduce electricity costs below those of conventional technologies. It also is to show the effectiveness of hot-gas cleanup on low-sulfur western coals.

- Wabash River Coal Gasification Repowering Project Joint Venture, a joint undertaking of Destec Energy Inc. and PSI Energy Inc., will use a nominal 265-MW IGCC power plant to repower one of six units at PSI's Wabash River Generating Station in West Terre Haute, IN. The objective is to show that a commercial-scale IGCC system can be economically and environmentally effective for

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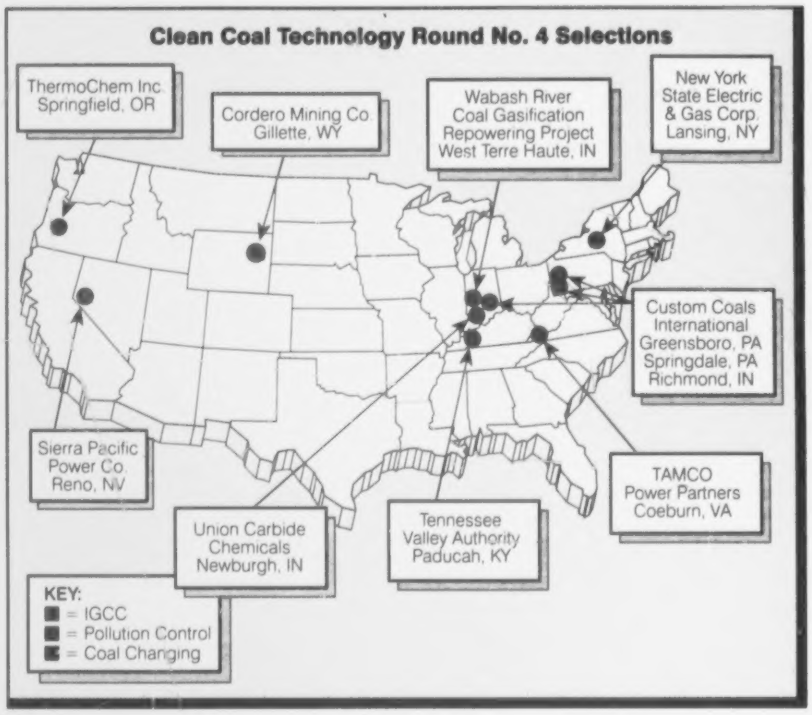
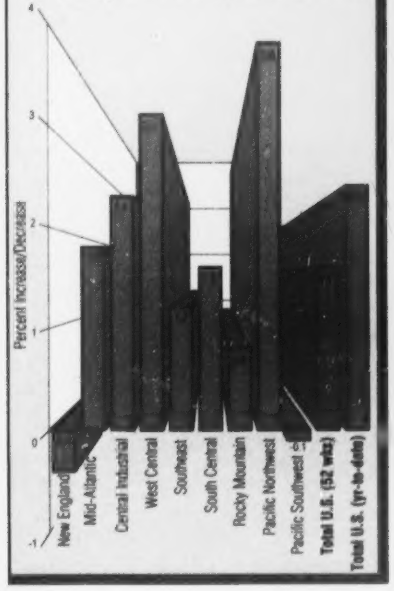


Clean Coal Technology Round No. 4 Selections

ELECTRIC OUTPUT

Some Growth Slowed

Net electric output from the Mainland U.S. electric utility industry continued its gradual increase for the 52 weeks ending Sept. 21, as reported by Edison Electric Institute. Mild weather throughout most of the country slowed the rate of increase.



Bailly Station is moving toward recovery

HAMMOND, IN—Work continues at a careful pace at the Northern Indiana Public Service Co. Bailly Generating Station after an accident damaged and shut down two units there, and slowed construction of a scrubber.

As of late September, results of an investigation and cost estimates for damage had not been completed.

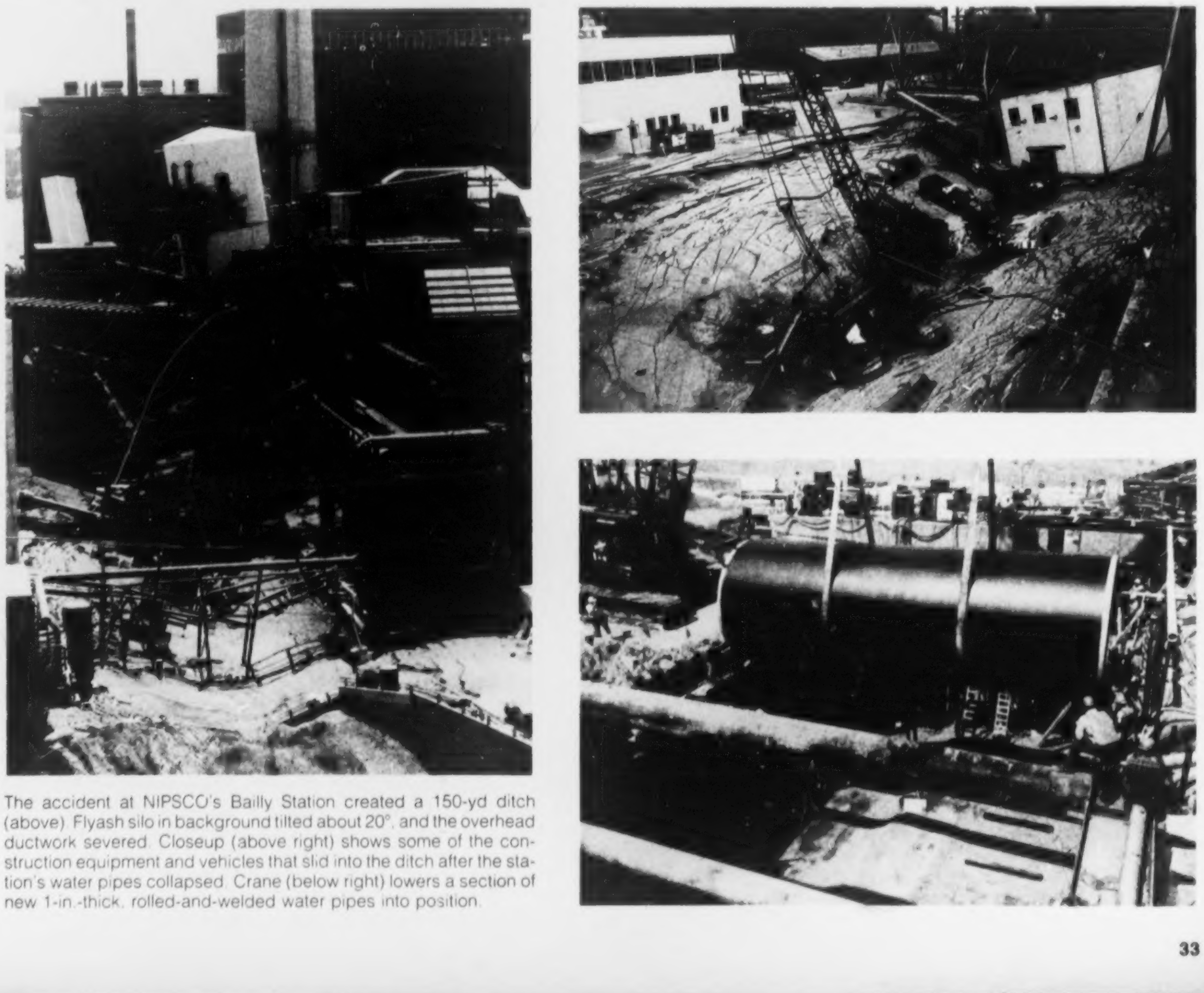
Pipes collapse

Bailly Station was shut down July 2 when the facility's two main underground circulating water pipes collapsed. The collapse created a ditch 150-yd long, 40-yd wide and 25-ft deep.

NIPSCO President Gary Neale said "...both the intake and discharge circulating water pipes have collapsed. There was structural damage to auxiliary buildings outside the main generating station."

Structures damaged included the

Continued on page 34



The accident at NIPSCO's Bailly Station created a 150-yd ditch (above). Flyash silo in background tilted about 20°, and the overhead ductwork severed. Closeup (above right) shows some of the construction equipment and vehicles that slid into the ditch after the station's water pipes collapsed. Crane (below right) lowers a section of new 1-in.-thick, rolled-and-welded water pipes into position.

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ELECTRIC LIGHT & POWER

EL&P

DECEMBER 1991
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VOICE OF THE ELECTRIC UTILITY INDUSTRY

LATE NEWS

Commercial nuclear fusion power moved closer to reality on Nov. 9 when the British Joint European Torus produced 1.5-2.0 MW of power in a pulse lasting for 2 sec. It was the longest sustained reaction to date and the first to add tritium to the deuterium "fuel." However, the experimenters said commercial fusion is many years off and depends on substantial advances beyond this success. See *EL&P*, 1/92.

Senate's vote to block consideration of its comprehensive energy bill (S.1220) "may end up costing us 300,000 jobs and add billions to our trade deficit," said Secretary of Energy James D. Watkins. "This country desperately needs a national energy plan." The president, the private sector and the American people can do parts of the job, "But we are never going to get a comprehensive energy policy without comprehensive energy legislation," he said. Hearings on House energy bills continue.

EPA proposes four rules containing the core acid-rain requirements in the Clean Air Act Amendments of '90, as expected: Permits (40 CFR Part-72), Allowance System (-73), Continuous Emission Monitoring (-75) and Excess Emissions (-77).

Electric vehicles received a boost as DOE joins Chrysler, Ford, GM and EPRI in the U.S. Advance Battery Consortium.

Sexual harrassment, p. 19.

Guide to Power-Gen '91, p. 23.

ComEd strikes deal, awaits franchise vote

CHICAGO – Commonwealth Edison Co. hopes to sign a new 29-year Chicago franchise by year end. CECo and the city's administration forged an agreement Oct. 22, but a series of 10 public hearings were scheduled prior to a city council vote.

"As with any negotiation, you don't come away from the table with everything you want. But this is a good agreement for the people of Chicago," said Mayor Richard M. Daley. "It provides customers with the prospect of greatly improved service, opportunities to cut their bills through conservation measures and a greater level of accountability on the part of Commonwealth Edison."

In a companion agreement to the franchise, CECo promised to budget $1 billion for improvements to the power delivery system over the next 10 years and to review and upgrade fire-protection standards, if needed.

Reliability of service became an issue during negotiations after two highly controversial substation fires in 1990. CECo increased 1990 power-delivery spending by 10 percent to $370 million (more than 60% over 1988 spending).

CECo's Chairman James J. O'Connor was pleased at the city's positive view. "We pledge to do what is necessary to keep earning that trust and to maintain the level of service reliability to which Chicagoans have grown accustomed over the past century."

In part, the agreement also would:

- Keep the franchise fee at 4 percent of revenues, but pay monthly to make it consistent with compensation provided to communities outside Chicago (which receive free electric service for municipal buildings).
- Retain the city's acquisition option, undergrounding provision, and Equal Employment Opportunity and Affirmative Action guidelines.
- Require CECo to spend $25-50 million on demand-side-management programs and energy conservation measures over the next five years, record and report outages to the city, and promise to reexamine the residential rate structure, especially for low-usage customers.
- Confirm, with the city, that ultimate rates are determined by the Illinois Commerce Commission.

CECo also would agree to a number of technological upgrades to improve reliability, including computerized outage mapping and distribution automation, and hurrying progress on a computerized transmission monitoring system.

In 1990, CECo and the city had agreed to extend Chicago's 41-year franchise agreement by one year until a new deal could be reached.

In similar news, the utility agreed in September to the major terms for a model franchise that will be offered to each of the nearly 400 municipalities CECo serves outside Chicago.

Settling major franchise agreements would ease a long uncertainty about the company's financial stability. CECo had continuing difficulties getting the latest of its nuclear plants into rates. CECo has 12 nuclear units, the most of any U.S. utility. The plants generate about 80 percent of the electric power used by 3.1-million customers in Northern Illinois.

Former managing editor becomes new *EL&P* leader

Chief editor Lincicome retires after 34 years

BARRINGTON, IL—Robert W. Smock has been named to head up the *Electric Light & Power* editorial program, succeeding *EL&P's* editor-in-chief, Robert A. Lincicome, who retires on Dec. 16. (See p.4)

Smock will become editorial director of *EL&P* and its sister publication *Power Engineering*, where he has been editor since 1986.

Lincicome retires from *EL&P* after 34 years, the last 22 as editor-in-chief. He applauded the selection of Smock as his successor, observing that "Bob is uniquely qualified to lead *EL&P* into the next century. He knows the indus-

Continued on page 14

Oakland PG&E fires cost more than $10 M

OAKLAND, CA—Pacific Gas & Electric Co. crews worked with firefighters during the devasting Oakland-area blaze, turning off electric and gas service and running new lines to key pumping stations after flames cut power.

At times, the wind-swept blaze was more than a 2000°F, 100-feet-high, 60-mph wave of fire. Underground electric facilities fused. PG&E's preliminary damage estimates exceeded $10 million.

From PG&E accounts, Sunday Oct. 20:

Early afternoon: 300 workers are in the fire area travelling with fire crews to de-energize lines, turn off gas at individual homes. One crew nearly lost when flames turn.

Mid-afternoon: East Bay MUD [Municipal Utility District] reports four key pumping stations have lost power, possibly compromising firefighting. PG&E crews working in sight of flames, run new line up backside of mountain to key Golden Gate pumphouse. Power restored by 6 p.m., three hours later. Service restored to second

Continued on page 9

Photo by PG&E's Alan Heald

Fireplaces stand like tombstones as PG&E crews work in the blue haze and ashes of the Oakland blaze, the most destructive fire of its kind in state history. Losses included 17.5 miles of distribution line and 225 transformers. PG&E crews removed 220 tons of debris.

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NEWS BRIEFS

JILL MINNER, Special Projects Editor

DOE sells pollution control technique to private firm

The Department of Energy said it has sold the rights to a pollution control technique, developed at its Pittsburgh Energy Technology Center, to NOXSO Corp. for $10,000.

According to DOE, the technology significantly increases destruction of nitrogen oxides, a pollutant known to contribute to acid rain.

DOE said the technique could play an important role in meeting the new requirements of the federal Clean Air Act, by enhancing the effectiveness of an advanced scrubbing system invented by NOXSO. The scrubbing system is scheduled for demonstration in DOE's multibillion dollar Clean Coal Technology Program in 1994.

"As we stated in the National Energy Strategy, the success of every research project in our portfolio ultimately depends on transferring results out of the laboratory and into commercial use. This technology transfer agreement is a textbook example of how federal scientists can work with the private sector to meet a market need," said Linda G. Stuntz, DOE acting Assistant Secretary for Fossil Energy.

Boston Edison forms energy advisory panel

Boston Edison Co. President and CEO Bernie Reznicek announced that the utility has established an Energy Advisory Panel to provide the utility with "candid, honest evaluations of our programs, policies and procedures as they affect customers and the market."

The panel, made up of nine commercial and industrial business leaders, will meet quarterly to discuss any energy-related concerns and opportunities that might impact area businesses. "It's designed as a forum for area businesses to voice their concerns to us, and for us to plug those concerns into our plans," explained Reznicek.

Topics scheduled for the panel's first meeting in February 1992, include the region's economic development, the cost of electricity, environmental concerns and actions, competition for energy customers, nuclear power and more.

NSWMA companies to form independent assn.

Member companies of the Institute of Resource Recovery (IRR) within the National Solid Waste Management Association (NSWMA) have announced their plans to withdraw from IRR in order to form an independent association.

According to NSWMA, the companies plan to withdraw on Jan. 1, 1992, in order to form an association that will principally advocate the role of waste-to-energy in public solid waste management policy.

The companies involved include: ABB Resource Recovery Systems, American Ref-Fuel, Foster Wheeler, Ogden Martin Systems, Reading Energy, Westinghouse and Wheelabrator Technologies.

Support growing for nuclear energy use: poll

The U.S. Council for Energy Awareness reports that a new Gallup poll found 73 percent of Americans believe nuclear energy should play an important role in meeting the nation's energy needs. A Cambridge Reports poll, taken in February 1990, showed 65 percent of Americans said nuclear energy should play an important role.

The Gallup poll also revealed that almost two-thirds of Americans are now aware that using nuclear energy to generate electricity cuts greenhouse gas emissions by displacing fossil fuel generation.

Utilities fined by NRC

The U.S. Nuclear Regulatory Commission recently proposed the following fines:

Alabama Power Co.
A $25,000 civil penalty for alleged violation of NRC requirements at the Farley nuclear power plant. NRC said the problem, allegedly caused by ineffective procedural controls and communications, involved a valve which had not been properly closed after testing was completed on a reactor in hot standby.

Duquesne Light Co.
A $25,000 fine for an alleged violation at Unit 1 of the Beaver Valley Power Station involving a pipe weld that had been omitted from the unit's drawings. The NRC staff alleges that prompt action was not adequately taken to identify and correct the problem.

Northeast Nuclear Energy Co.
A $50,000 fine for allegedly failing to identify and correct a problem at its Millstone Unit 3 nuclear power station. An NRC inspection found that employees did not aggressively determine the cause of and correct a reduction in water flow through the service water system caused by a buildup of mussels in the piping.

Virginia Power
A $125,000 civil penalty for alleged violation of NRC requirements at the Surry Power Station. The violation, identified during an NRC inspection review, involved full operability of certain safety systems.

FERC OKs agreements for Georgia Power and Oglethorpe Power

Oglethorpe Power Corp. and Georgia Power Co. have received approval from the Federal Energy Regulatory Commission on operating agreements which were approved by the Rural Electrification Administration in August. Under the agreements, Oglethorpe Power may buy and sell bulk power and establish new terms for the purchase of power from Georgia Power.

According to Tom Siegrist, Oglethorpe Power vice president-system operations, the agreements confirm the utility's right to use the state's Integrated Transmission System to purchase power from and sell power to other utilities and facilitate Oglethorpe's participation in the national bulk market.

"The agreements place us in a better position to secure power for our Member Systems in the face of an increasingly competitive utility environment," Siegrist stated.

New name for PG&E-Bechtel Generating Co.

PG&E-Bechtel Generating Co. announced that it is changing its name to U.S. Generating Co. "U.S. Generating Co., which is a partnership of Pacific Gas and Electric Co. and Bechtel Group, Inc., has now established itself as a nationally recognized and leading developer of cogeneration and independent power projects. It is important to more firmly establish the partnership's unique identity and to emphasize its nationwide scope in the business of generating and selling electricity on a wholesale basis. We think the name U.S. Generating Co. accomplishes both of these objectives," explained Joseph P. Kearney, president and chief executive officer of the firm.

UFI benefits from legislation; helps utilities comply with Clean Air Act

Utility Fuels Inc. (UFI), Houston Industries' coal supply and handling subsidiary, recently expanded its railcar fleet to help utilities and other companies comply with the Clean Air Act, and at the same time increase its own profits.

"As more utilities work to comply with clean air legislation by 1995 and 2000, you'll see more utilities switching to Western coals," stated Lawrence J. Rogers, UFI vice president of business development. "We're working to be in a position to help them transport the 'clean' coal they need, while earning a reasonable profit for UFI."

UFI currently supplies 17 million tons of coal and lignite annually to six of Houston Lighting & Power Co.'s generating units. UFI has also entered into an agreement with Wisconsin Public Service Corp. to provide the utility with railcars to haul low-sulfur coal from Wyoming to Wisconsin.

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IEEE splits RF guidelines into two exposure levels

1st-time move eases some exposure standards; study continues on more controversial EMF

Mark T. Hoske
News Editor

An Institute of Electrical and Electronics Engineers' committee has split its radio-frequency (RF) exposure standards recently, essentially into two site-dependent levels—"controlled" and "uncontrolled" exposures.

The move, which updates the 1982 American National Standards Institute RF exposure guidelines, eases some exposure standards and tightens others.

The recommended changes in guidelines came from the committee's review of 321 papers. Researchers also included "important improvements in rules for valid measurement of electric and magnetic fields" and expanded rules for relaxing the exposure limits for partial body exposure.

Also more controversial 'EMF'

The general term electromagnetic fields "EMF" includes both electric and magnetic fields. The present scope of work includes developing standards in the RF range of 3 kHz to 300 GHz. Work by another subgroup is looking at fields under 3 kHz, which would include some of the very controversial EMF exposures about which the public has increasing concerns.

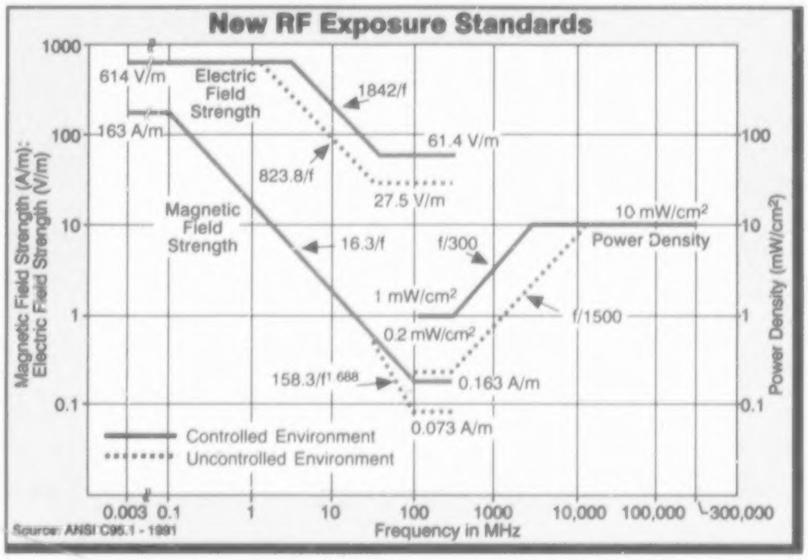
The committee involved in these efforts is the Standards Coordinating Committee 28 (SCC-28), under the IEEE Standards Board.

SCC-28 continues study for setting future exposure guidelines. As the sole sponsor for setting EMF exposure standards, IEEF has asked outside organizations for funding to continue, and perhaps expand, the complex effort to produce guidelines and conduct research where lacking.

The latest guidelines

Eleanor R. Adair, SCC-28 member, and a researcher at the John B. Pierce Laboratory in New Haven, CT, recently explained the committee's work on the new standards.

After considerable debate, the committee agreed, for the first time, to split the standards into "uncontrolled" and "controlled" exposures. Adair said the committee felt that the labels "public" and "occupational" are highly charged and political, and so avoided them. Adair explained that it would be wrong to equate controlled and uncontrolled exposures with occupational and public exposures because the former is site-specific, while the later is population dependent.



Source: ANSI C95.1 - 1991

The latest guidelines were based on exposure levels far below what caused lab-animal behavior disruption. "Behavior disruption is the smallest observed effect that may indicate a hazard for people. We agreed this was a good basis for setting the new guidelines," said Adair.

Adair gave a work-equivalent analogy: the behavior disruption minimum of 4W/kg is similar to light housework (or driving a truck). A safety factor of 10 was added to get the controlled environment exposure (0.4 W/kg) equivalent to putting on a light sweater. For uncontrolled environments, an additional safety factor of five was added to the 0.4W/kg exposure.

Recommended exposure limits vary for each category, but are generally less for uncontrolled exposures.

Within the range of resonant frequency for humans, the new standard for controlled exposure is identical to the 1982 standard. In the higher frequencies, the standards are relaxed, Adair noted. (See related story.)

The split in exposure guidelines and additional issues has contributed to extended debate, but the resulting guidelines truly reflect current knowledge, Adair added.

Any comments about the revised RF standard may be directed to IEEE, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331.

Sources involved in the effort below the RF range said a lot of low-quality EMF research and irresponsible reporting of some findings has caused much of the public's concern on the issue. This concern, coupled with lack of federal EMF guidelines, may give Congress an excuse to step in, others suggested. EMF was not in energy legislation under consideration as of early November.

Choosing research to support possible standards on the lower frequencies, or extra-low frequencies (ELF) is no easy task, explained SCC-28 member Thomas F. Budinger, of Lawrence Berkeley Laboratory.

Last year, SCC-28 formed a subcommittee which seeks to set safe guidelines for 0-3 kHz extra-low frequency (ELF) exposures. Sixty persons, including biologists, physicists, engineers and medical scientists, are now members of the subcommittee.

"If you could realize how bad almost all of these [ELF] epidemiological studies are," said Budinger, "you'd wonder if we weren't being led down the wrong path."

What is valid research?

"I can't say much about the [usefulness of most] data." Too many studies use "soft data to show trends, but such conclusions are not statistically correct," explained Budinger. The numbers of observations need to be much greater before a study's conclusion is reliable. A study with an inadequate statistical base is not hard data and not valid to report as a "trend."

For example, a reliable study of 1000 people would have to show a 300-percent increase in cancer over incidence in the control group. An increase in cancer incidence of 10, 50, or even 200 percent wouldn't be statistically significant, he noted. If studying a single type of cancer, within the same example, a much greater incidence than a tripling would be required to show a valid cause and effect, Budinger explained.

Budinger heavily criticized researchers and others whose data reporting causes panic among the public and is emphasized by the media.

"There's too much bad research, not enough good research and not enough research dollars," he lamented.

For research on guidelines on the full range of exposures, SCC-28 is sending a request for three-years of funding to organizations including the U.S. Department of Energy, the Air Force, Army, Navy, industry, Green Peace, state governments, and the U.S. Public Health Service.

No limits for public exposure

The U.S. government, Budinger said, doesn't regulate EMF exposures, despite seemingly high exposures in some public places. In the Washington, DC, subway system, Budinger cited static magnetic fields of 3-21 gauss near the door of a rail car, and as much as 60 gauss on the floor, under certain conditions. Sixty gauss is enough to activate or deactivate the reed switch of a pacemaker, he noted.

David Janes, recently retired from the Environmental Protection Agency, also expressed concern about the lack of guidance. "There are no federal occupational or health standards for electric

Continued on page 9

Illinois utility wins insurance coverage for coal-gas cleanup

Central Illinois Public Service Co. (CIPS) claimed victory in the first jury trial verdict concerning insurance liability for a former coal-gas manufacturing site.

At least seven similar suits are pending around the United States, and more than 1500 similar sites could require cleanup, according to a law firm representing CIPSCO Inc., the utility's holding company.

The 100-year-old Taylorville, IL, site turned into a Superfund cleanup project, where cleanup costs may total more than $12 million, according to CIPS. The Springfield, IL-based electric and gas utility has spent more than $7 million at the site through November 1991, working with the Illinois Environmental Protection Agency (IEPA).

CIPSCO has identified a total of 12 sites, owned by the utility, or predecessor companies (*EL&P*, 12/87, p.15).

The defendent, the American Empire Surplus Lines Insurance Co., may have to pay CIPS for investigation and cleanup costs at the former site under a $15-million environmental impairment liability policy written in 1983 and later renewed.

Prime arguments

A Cook County, IL, jury found that CIPS had neither expected nor intended contaminants to be released from its former manufactured gas plant in Taylorville, IL. The jury also found that CIPS did not knowingly discharge contaminated water resulting from the gas manufacturing process directly onto the ground. These were prime arguments for the defense denying coverage under the environmental policy, CIPS' attorneys noted.

"The court is expected to further clarify the question of whether the utility also is entitled to coverage under its comprehensive general-liability policies," CIPS said. As of early November,

Continued on page 20

IEEE committee sets standards

The IEEE Standards Coordinating Committee 28 (SCM-28) is responsible for revising the present radio-frequency (RF) standards.

The scope includes: Developing standards for the safe use of electromagnetic energy relative to the potential hazards of exposure of man, volatile materials and explosive devices to such energy in the range of 0-300 GHz. It is not intended to include infrared, visible, ultraviolet or ionizing radiation.

SCC-28's six subcommittees have issued three standards, one guide and one recommended practice.

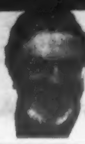
- **C95.1-1982, Human exposure to radio-frequency EMF, 300 kHz to 100 Ghz.**
- **C95.2-1981, Frequency radiation hazard warning symbol (reaffirmed in 1989).**
- **C95.3-1973, Techniques and instrumentation for ~~measuring EMF~~ at microwave frequencies (reaffirmed in 1979).**
- **C95.4-1978, Guide for preventing radiation hazards when using electric blasting caps.**
- **C95.5-1981, Recommended practice for measuring EMF, RF and microwave fields.**

Revisions of C.95.1-1982 include expanding the frequency range, limits on induced body current to prevent RF shock or burn, relaxing exposure limits to magnetic fields at low frequencies, and relaxing exposures to high frequencies that are compatible at 300 GHz with existing infrared maximum-permissible-exposure (MPE) limits.

Compliance with the MPE in controlled environments can be achieved normally by wearing protective gloves, staying clear of metallic objects and training personnel. Evaluating the magnitude of the induced currents will normally require a direct measurement.

The range of "safe" exposure levels is shown in the graphic.

—Wayne Beaty
Senior Editor-Power Delivery



COMMENTARY

The well-fed woman warbles

This is the 362nd and final commentary I've pounded out as Editor-in-Chief of *Electric Light & Power*. Now it's off to greener pastures (and warmer climes) and the opportunity to do some of the things I've put aside over the 34-plus years I've toiled in *EL&P's* editorial and sales garden. Florida beckons for the winter, and in the Spring Joyce, my wife of 39-plus years, and I will retreat from sultry southern temperatures to head for our lodge in the Maine woods.

For years I've joked that I didn't know what I wanted to be when I grew up. Now I know. I want to be retired.

So I'm off to other things. But afraid to go cold turkey, I will still keep my journalist's hand in by acting as Editorial Director of *Power Delivery Product News*, our new quarterly magazine reporting on transmission, distribution and load management/conservation products and services. *PDPN* will premiere in January. Computers and modems make almost all things editorial possible from anywhere I go.

These years with *EL&P* have been exciting and rewarding ones. I've been privileged to meet and know many of the finest people God ever put on this earth...the men and women who manage, engineer and operate the greatest electric system in the world and who are deeply dedicated to serving their customers. Great people; I've never known one I wouldn't want for a next-door neighbor.

Over the years I've witnessed first-hand the technological explosion in the electric industry...the advent of commercial nuclear power, development of EHV and then UHV transmission, underground distribution first, and subsequently underground transmission. Other technologies developed since I joined *EL&P* in 1955 include pump-storage and low-head hydro technology; barehand live-line maintenance even at EHV levels; helicopter construction of transmission tower-lines and substations; thermography; SCADA; remote metering; combined-cycle generation, HVDC, fluidized-bed combustion, fiber-optic communication, geothermal power conversion...the list could go on and on.

As a journalist, these were exciting years. Initially, of course, electricity was just *there*, no problem. Rates kept falling. Utility organizations could do little wrong. Electric energy was predicted to become too cheap to even meter. Electrification of the nation was virtually complete; service reliability was almost perfect. Then came the Northeast Blackout of 1965, which challenged the engineering and operating policies behind integrated, interconnected systems. In the late '60s environmental challenges were hurled at the industry for the first time. A few years later the Arab Oil Embargo threw energy economics onto a cocked hat. From a Congress that scarcely recognized energy as a subject worthy of even casual discussion (except when there was a hydro project's political windfall involved), we've progressed to a Congress where almost every member professes to hold at least one major key to solving the nation's energy problems and guaranteeing an abundant energy future. It's really gotten progressively interesting since the early '60s

I feel good about *EL&P* and what it has become. The staff is dedicated, talented and ready to do even more in the years ahead. Bob Smock, who was a member of the *EL&P* staff for 15 years before becoming Editor of our sister publication, *Power Engineering*, returns as my successor and becomes Editorial Director of both *EL&P* and *PE*. After 34 years *of EL&P* being almost as much a part of my family as my wife and daughters, I would hate to retire without confidence that the magazine's editorial direction was in good hands. With Bob coming back to head up the *EL&P* editorial program, I have no concerns on that score.

To each of you who've read these commentaries over the years, thanks for your time, your support and your suggestions and criticisms. The pleasure's been all mine, I assure you. I've had a ball.

And with that, I suppose all that's left is to turn out the light and close the door...and listen...yessir, like the man suggested, you know it's all over when the fat lady sings.

Robert A. Lincicome, Editor-in-Chief

Happy holidays to all our readers from the EL&P editorial staff

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Bob Lincicome "retires" from EL&P

After 34 years of service to *Electric Light &* Power magazine, and seeing the publication grow again out of the soft 80s, Bob Lincicome is removing his mantle as Editor-in-Chief of *EL&P* turning the leadership role over to Bob Smock, presently editor of *Power Engineering* magazine. Mr. Smock becomes Editorial Director of both *EL&P* and *PE*.

Bob Lincicome started with *EL&P* in 1955, then took a brief sabbatical in the early 60s. He returned to the magazine in 1963 as News Editor and soon became Business Editor. Bob then moved up to the position of Managing Editor and in 1970 he was named Editor-In-Chief.

Bob Lincicome has seen the electric utility industry change and evolve with mergers and acquisitions, growth and no growth, new leadership and new directions. He used his editorial page to compliment and to chastise, to report and to discuss, to make a stand and to open up discussion. Most importantly Bob wrote for and about the industry...an industry which he has been proud to serve and promote.

In 1970 Bob was named to the Edison Electric Institute's Award Nomination committee. Lincicome was named Chairman in 1971 and has served in that capacity ever since. He has enjoyed the challenge of selecting the candidates and working with EEI and their associates.

Bob has authored numerous articles dealing with the electric power business and has lectured at various schools and universities. He serves on the Power-Gen Program Committee and other industry committee groups.

You may have seen Bob and his wife, Joyce, while attending industry functions, such as the Southeast Electric Exchange, EEI's Annual Meeting, UPMG and USCEA. All of you have met Bob through his *EL&P* Commentary.

While Bob is "retiring" from *EL&P*, he is "joining" us as editor of our new venture, the quarterly product tabloid *Power Delivery Product News*. Bob figures he can handle this challenge while he handles the equal challenge of building his "retirement" home in the Maine woods.

Bob, congratulations on what you have done to not only build *EL&P* but the electric utility industry as well. Thank you for your tireless effort and support. Best of luck and have fun!

Sincerely,

Arthur L Rice

Arthur L. Rice
Publisher

TVA enters year 5 without a rate hike

KNOXVILLE, TN—TVA will require no rate increase for the fifth consecutive year and is continuing restructuring efforts to make itself, and the region, more economically competitive. TVA's last rate increase was granted in 1987.

In the past three years, about 1600 industries have announced plans to locate or expand in the Tennessee Valley region, creating almost 90,000 jobs, TVA noted.

William F. Malec, TVA's chief financial officer and senior vice president of Finance and Administration, said that TVA's operating results through the third quarter of fiscal year 1991 and financial projections for fiscal year 1992 enabled him to recommend that electric rates be held constant for a fifth consecutive year.

Malec noted that the company's key managers last year challenged themselves to work toward another year of rate stability.

"We have received tremendous support from our employees and can achieve that goal," Malec said. "TVA has achieved cost efficiencies and expense reductions unparalleled in the electric utility industry. By keeping costs down, increasing efficiency and producing reliable power, we all have helped make TVA and the Tennessee Valley stronger and more competitive," he said.

Between 1988 and 1991, TVA reduced annual operating expenses by more than $250 million.

In 1992, operating expenses are projected to drop to $3.3 billion, well below the 1988 figure of nearly $3.5 billion. The decrease is expected although TVA anticipates a 12-billion kWh increase in power production for the same four-year period.

TVA's total interest expense in 1992 is anticipated to be $1.7 billion, compared to $1.9 billion in 1988.

Sales, generating mix, future

TVA's power sales are expected to increase by about four percent in 1992, Malec said. Municipals and cooperatives receive more than 80 percent of TVA's output; industries receive almost 15 percent.

In 1990, TVA's 11 coal-fired plants produced 68 percent of its electricity; 29 hydroelectric dams, 19 percent; the Sequoyah Nuclear Plant, 13 percent.

Clean-air compliance strategies were expected to be discussed at the Nov. 20 board meeting.

Nuclear generation is expected to contribute a greater percentage of TVA's power with the restart of Browns Ferry Unit 2. That unit, in Athens, AL, resumed power generation this summer, for the first time in six years. Unit 3 is scheduled for operation in 1993. Chairman Marvin T. Runyon has mentioned that within two or three years, TVA may be a candidate for the nuclear industry's next nuclear plant order.

Total revenue for 1992 is expected to be about $5.4 billion, up from 1988's $5.3 billion. While Department of Energy payments to TVA decreased from $521 million in 1988 to $160 million in 1992 (see below), non-DOE revenue increased from $4.8 billion in 1988 to $5.2 billion in 1992.

Out of construction

Another way TVA has cut costs is by its decision to leave the construction and modification business. About 500 permanent TVA employees were affected.

TVA's Generating Group President Oliver D. Kingsley Jr. explained, "TVA

Continued on page 12

NERC: clean-air regs, transmission EMF/access issues threaten reliability

PRINCETON, NJ—Electric utilities' increasing reliance on short lead-time generating resources has made their 10-year plans less detailed than in the past.

Even so, major reliability concerns, taken from analysis of those plans, include the effects of clean-air regulation, the increasing role of non-utility generation and transmission siting and access issues, according to North American Electric Reliability Council's "Reliability Assessment 1991-2000." (See tables this page.)

In that yearly report, NERC identified six key issues that will affect reliability during the next 10 years. These are:

- **Effects of clean-air regulations.** "Uncertainties about mining and transportation, and the timely availability of equipment and skilled labor are concerns."
- **Fuel supply adequacy.** Expected significant increases in utility use of natural gas has some utilities extremely concerned about fuel availability, especially during cold snaps, and startup of peaking combustion turbines.
- **Greater operational complexity.** Operating interconnected electric systems will become more complex with the effects of clean-air regulations, proliferation of non-utility generators and increasing demands for transmission services.
- **Transmission siting, services.** Expansion of transmission is very difficult due to increasing obstacles to siting and certification, partly from concerns about alleged adverse effects of electric and magnetic fields. "Increasing demands for transmission services, including legislative proposals for mandated services, could jeopardize reliability."
- **Changing business environment.** "Increasing use of NUGs and demand-side management means electric utilities will have less direct control over the resources needed to maintain reliability. Also regulatory impediments continue to be disincentives to maintaining reliability."

During the next 10 years, the U.S. will get 20 percent of new capacity from NUGs (17,700 MW). Canada will receive 10 percent, or 2400 MW. By 2000, NUGs will represent more than 4 percent of capacity in the U.S. and more than 2 percent in Canada.

U.S. peak demand will grow by 1.9 percent per year; Canada, 2 percent.

Complying with clean-air regulations means increasing some coal mine production by as much as 170 percent, having adequate numbers of rail cars, and having various manufacturers supply equipment orders in time. Deadline compliance in 1995 and 2000 may make emergency generating resources less available, and require that transmission lines carry greater loads, according to NERC.

Generating Unit Additions, Changes, and Retirements (1991-2000 Forecast)

	United States		Canada		NERC-Total*	
Type	Thousands of MW	% of Total	Thousands of MW	% of Total	Thousands of MW	% of Total
Nuclear	5.9	6.6	2.6	11.5	8.6	7.5
Coal	15.1	17.0	1.9	8.3	17.7	15.6
Hydro	1.1	1.2	12.7	55.0	13.9	12.3
Oil/Gas	34.2	38.3	2.3	9.9	36.8	32.5
Pumped Storage	2.5	2.8	0	0	2.5	2.2
Other (Utility)	12.8	14.3	1.1	4.8	13.9	12.2
NUGs (Net Additions)	17.7	19.8	2.4	10.5	20.1	17.7
Additions	89.3	100	23.0	100	113.4	100
Changes	10.6		0.4		11.0	
Retirements	-4.3		-0.5		-4.8	
Net Total	95.7		22.9		119.6	

* Includes additions in WSCC-Mexico.

Source: NERC Reliability Assessment 1991-2000.

Preliminary Electric Utility Responses[a] to the U.S. CAAA of 1990 - Phase I

	Capacity Affected	
	Thousands of MW	% Total
Fuel Switching		
Low-Sulfur Eastern Coal	29.2[b]	37.1
Low-Sulfur Western Coal	14.7[b]	18.7
Low-Sulfur Local Coal	1.9	2.5
Natural gas	2.4	3.1
Other	1.5	1.9
Subtotal	49.7	63.3
Scrubber (FGD System) Additions	19.5	24.7
Emission Allowances	8.4	10.7
Unit Retirements	0.3	0.4
Unknown	0.7	0.9
Total	78.6	100

[a] As of June 1991.

[b] Corresponds to additional coal production requirements of about 70-million tons/year for low sulfur Eastern coal and about 50-million tons/year for low sulfur western coal, based on a 65% capacity factor.

Source: NERC Reliability Assessment 1991-2000.

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from page 4

TVA—streamlining a giant...

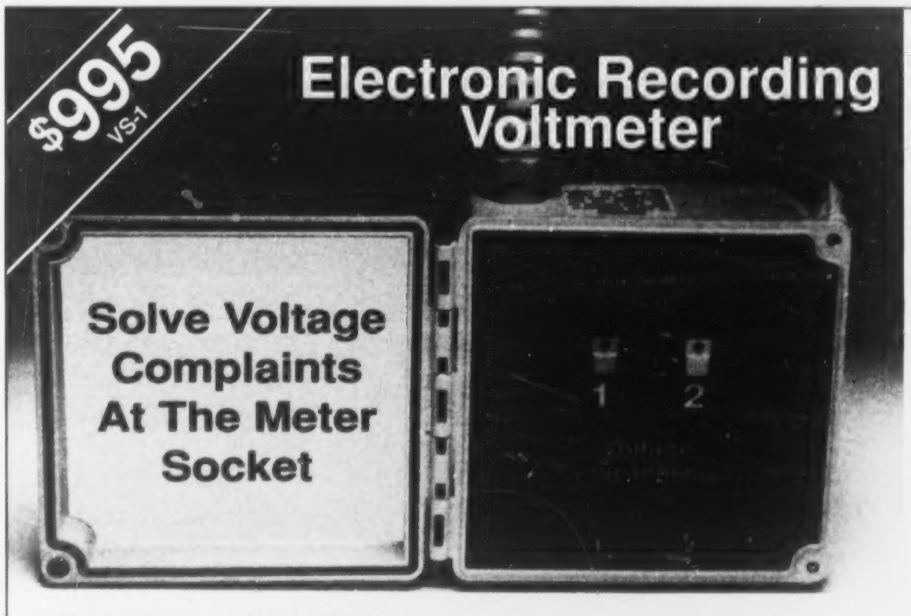
is adopting the standard utility practice of hiring private contractors for major construction and modification projects, such as the completion of Watts Bar Nuclear Plant, modification of Browns Ferry Unit 3 and work to comply with the Clean Air Act," Kingsley said.

"Our aim is to be the best power plant operator in the utility industry. We're going to get there by concentrating on excellence in operation and maintenance of the power system, which is our basic business."

Kingsley emphasized that local craft workers will continue to be employed in construction projects formerly performed by outside contractors. He said the number of TVA construction and modification jobs will increase in the future as a result of fossil and hydroelectric plant modifications and continuing work on TVA's nuclear facilities.

As part of the changes, TVA and the Tennessee Valley Trades and Labor Council signed new agreements. The agreements allow more flexibility in maintenance and construction work and allow TVA to deal with fewer unions performing permanent work within its power plants.

Under terms of the new agreements, contractors for all projects of $250,000 or more will hire their trades and labor workforce through referrals from the unions currently representing TVA employees. Contracts below $250,000 and certain specialty contracts will not be required to follow the new agreements.



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WAYNE BEATY, Senior Editor-Power Delivery

Information on software available with new directory

BARRINGTON, IL—The new 1992 *EL&P Electric Utility Industry Software Directory* now is available. It provides instant access to the latest software programs and sources including programs for line design, construction, transformer loading, compliance with federal regulations or any number of about 60 other categories.

First of its kind

When issued for the first time last year, the directory was the first of its kind for the industry.

The new *1992 Directory* lists almost 600 programs from 250 vendors including some electric utilities and international vendors. All information is listed alphabetically by program title within application categories and alphabetically by supplier with the programs each offers.

Each listing includes a comprehensive description of the software, the appropriate operating system(s), special accessories, compatibles, language/memory requirements, the supplier's name and, when available, the price. It also gives the current address, phone, fax and telex numbers plus a contact name for each supplier.

Categories

Some typical categories include:

- About 30 programs on accounting/statistics/management functions and techniques.
- Some 20 programs on automated mapping/facilities management/geographic information systems.
- Cable systems—To help design systems, calculate pulling tensions, ampacity, voltage drop, etc.
- Civil engineering programs calculate transmission tower footings and anchors.
- Cogeneration—All the technical aspects of various types of cogeneration projects are considered, including economic feasibility, detailed cash flow statements, equipment selection and purchase and generation of electricity and steam.
- About 25 distribution system design programs. Includes substations, primary feeders, secondary, services, reliability and restoration procedures following outages.
- Engineering—with all the classic stress analysis, heat transfer, power flow, haramonic simulation, voltage calculation, fault analysis, and other problems.
- Environmental compliance programs.
- Fuel supply for both electric and gas utilities. Some calculate heat balances for fossil fuel (including coal, natural gas, oil, waste, wood), combined-cycle, nuclear, and repower units. Data on price of fuel includes cost comparisons, supplier validations, price trends, studies and fuel mix analysis.
- Generation—Over 100 programs for design, operation, maintenance, analysis and planning.
- Energy and load management for modeling residential, commercial and industrial loads and their effects on the power system. This category also includes transformer inventory and load management (TILM) programs.
- Maintenance programs for generation, transmission, substation, distribution, warehouse and yard inventory, and tree trimming.
- About 25 programs that deal specifically with marketing electric energy.
- System operations—including forecasting techniques and analysis, stability programs, power flow analysis, and simulators.
- System protection and fuse coordination.
- Training/education.
- Transformers.
- Transmission systems—including design, construction, operations and maintenance.
- Transportation and vehicles.

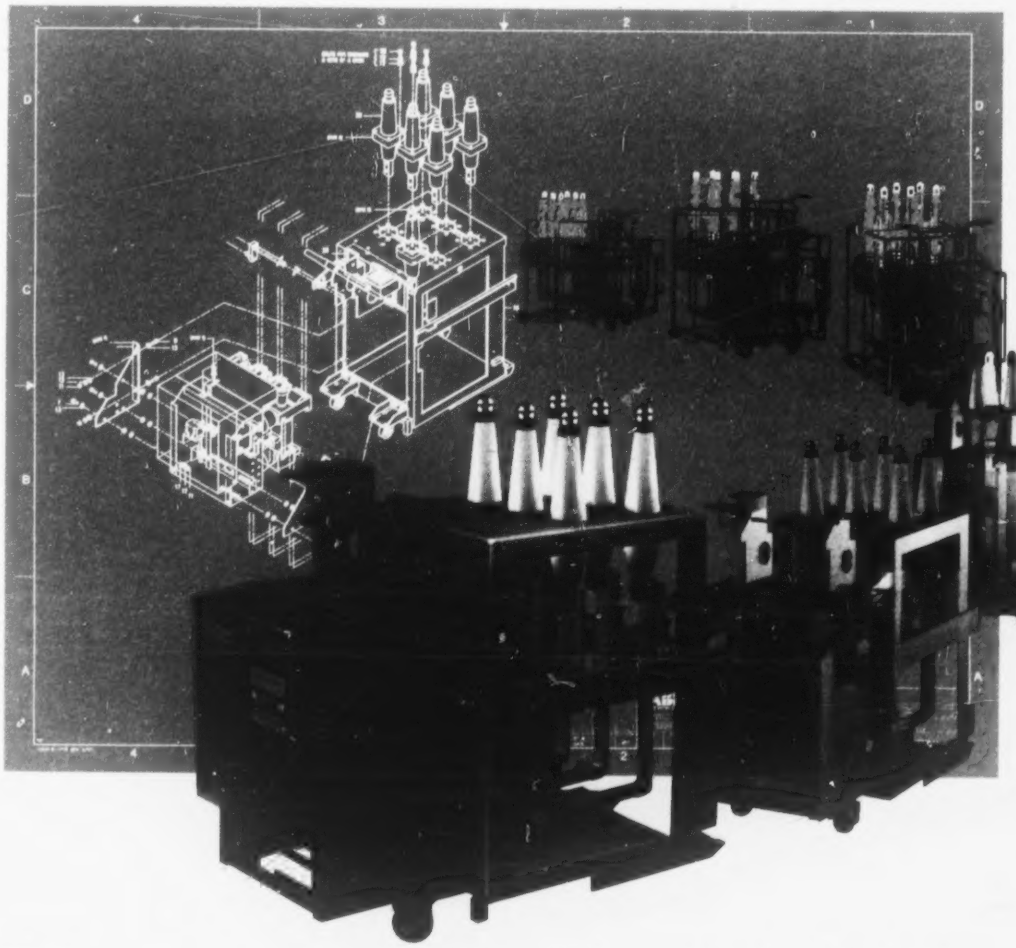
New programs are being written and introduced to the industry almost weekly so the directory will be kept current at each new publishing.

Add a program

To add a new program listing for the next directory, contact Wayne Beaty, Senior Editor—Power Delivery, EL&P, 1250 S. Grove Ave., Suite 302, Barrington, IL 60010; ph. 708/382-2450, fax 708/382-2977.

Correction

An *EL&P* table (9/91, p.3) should have listed electricity rates for Louisiana Power & Light Co., as 5.7 cents per kWh in April '91, and 5.8 cents per kWh in April '90, based on 1000 kW for 450 MWh per month. LP&L is a subsidiary of Entergy.



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Inquire R.S. 17

Long-term incentive plans for executives gain favor

Christopher R. Healy
Matthew G. Martin
Hewitt Associates

LINCOLNSHIRE, IL—In a game of "catch up" with general industry, major electric utilities increasingly are adopting long-term incentive plans as part of the total compensation package provided to executives.

Among 60 large utilities (primarily electric, with average revenues of $2.5 billion), two-thirds currently have some type of long-term incentive arrangement—about twice as many as five years ago. This recent growth has narrowed the gap between electric utilities and "general industry" where more than 90 percent of employers have one or more long-term incentive plans.

Long-term incentive plans—which include stock options, restricted stock and performance share/unit plans—are intended to reward executives for improving company performance as measured externally by stock price/dividend yield or internally by accounting-based financial measures. These plans are usually limited to the most senior executives in an organization—typically the top 1-3 percent of the salaried exempt population, usually those executives earning $90,000 or more in base pay.

Similar to annual bonus plans, long-term incentives shift a greater portion of an executive's total compensation from "fixed" pay (in the form of base salary and benefits) to "at risk" pay.

Award sizes are more conservative than in general industry, in-part because long-term incentives are still relatively new among utilities. For example, the median annualized stock-option award size for a utility CEO is 125 percent of salary—compared to 175 percent of salary for their general industry counterparts. For performance-share or unit plans, median awards for a utility CEO are 45 percent of salary versus 60 percent in general industry. Restricted-stock median awards for utility CEOs are 35 percent and 45 percent of salary, respectively. (Award size is determined by share price multiplied by number of shares divided by salary.)

From another perspective, the value of long-term incentives for utility CEOs typically represents only about 20 percent of total compensation. In contrast, for general industry CEOs long-term incentives comprise about 40 percent of total compensation. As long-term incentives become more common and widely accepted in the utility industry, their value is expected to become a larger portion of the pie.

Among the factors contributing to the explosive growth of long-term incentives in the utility industry is the need to provide competitive compensation packages.

To attract and retain top executives from other industries, long-term incentives are being viewed as necessary—especially for utilities diversifying into non-regulated businesses.

Some managements also recognize that a longer-term orientation to compensation provides more support for planning and investment cycles. In addition, many utilities are seeking ways to create a stronger link between executive compensation and the interests of shareholders and customers. And finally, with continuing deregulation, utilities are experiencing greater competition—and that means management needs to increase its focus on long-term financial performance.

However, regulators may not allow a utility to include the cost of a long-term incentive plan in rate base unless the plan explicitly serves customer interests. If disallowed, shareholders must bear the cost. In addition, regulatory limits on rate increases can prevent management from maximizing profits and, potentially, stock price appreciation—measures typically used in long-term incentive plans. Both issues mean utilities have to give special consideration to performance measures in long-term plans.

Other barriers include an organization's culture, which may not support long-term incentives; the potential for negative publicity on a highly sensitive issue; and resistance to incentives—which may come from executives, shareholders or customers.

The most common long-term incentive arrangements among utilities are stock option plans. (See table.)

Stock option plans, which reward executives for price increases in stock, are less common among utilities than general industries. One reason may be that regulations usually limit utility earnings—so the upside potential of stock appreciation is not as great. However, since dividend yields tend to be higher among utilities, some utilities have added dividend equivalents, thus heightening the focus on total shareholder return.

Long-term Incentive Plans

	Utility	General Industry
Stock Options	46%	80%
Performance-based Plan	40%	48%
Restricted Stock	34%	44%

Totals exceed 100%. Some employers have multiple plans.

Performance-based incentive plans appeal to utilities, allowing more flexibility and creativity in defining performance measures that benefit customers and shareholders. A utility might use net operating income and/or earnings per share along with some customer-related measure, such as service rates compared to a peer group of utilities or cost per kilowatthour. Measures tied to demand-side management also are becoming more common as utilities increase efforts to encourage efficiency and lower customer costs.

Restricted stock, which provides executives with an outright grant of stock subject to a specified holding (or "vesting") period, is used primarily as a retention tool. With some utilities seeing their historically low executive turnover rates begin to rise, restricted stock may become more common. In general, it is used less often than other vehicles because some employers and shareholders view it as a "giveaway."

Long-term incentive arrangements will continue to grow in prevalence and importance among electric utilities as a way to ensure competitiveness and support the commitment to shareholders and customers.

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Inquire R.S. 18

NRC AI team reports on Wolf Creek

WASHINGTON—The Nuclear Regulatory Commission sent a five-member Augmented Inspection Team (AIT) to the Wolf Creek nuclear power plant, located near Burlington, KS, to look into the effects of a partial loss of power there on Sept. 23.

Power loss effects

The power was being supplied from offsite, and the onsite loss caused a tripping of two reactor cooling pumps, loss of a circulating water pump, and loss of service air to the spent-fuel-pool transfer-canal boot seal.

When the seal was lost, 6-8 ft of water leaked from the top of the spent fuel pool into the transfer canal, rendering the spent-fuel system inoperable. However, the spent fuel did remain covered with water.

The plant was shut down for refueling when the partial loss of power occurred about 10:35 a.m. But the water leak was not discovered until about 12:15 p.m.

The AIT planned to develop a better understanding of the intiating event, its significance for safety, and potential concerns for all similar nuclear generating plants. Its onsite work began on Sept. 25, and the group finished on Sept. 30. The report was ready in late October.

The team:

- Reviewed documentation, plant conditions at the time and the sequence of events.
- Assessed plant structures, systems and components that caused, contributed to or were used during the event.
- Review operator and management response to the event.
- Assessed plant conditions that mitigated it.
- Reviewed procedures, alarms and indications.
- Reviewed contingency actions associated with plant conditions.
- Looked into shutdown risk and human factors involved.
- Reviewed corrective actions planned by the operator, Wolf Creek Nuclear Operating Corp.

No nuclear incident had to be declared due to the power loss.

Dealing with zebra mussels

ITASCA, IL—The map shown here says it all—or almost all. If your power plant is located within the striped-and-shaded area of the continent and on any kind of waterway, you will probably have to deal with zebra mussels in the near future.

Unfortunately, not being within the striped area does not necessarily preclude the mussels, *Dreissena polymorpha*, from reaching your facility.

A maybe

The area shown, which contains 70 percent of U.S. power plants and a large number of Canadian ones, is merely an estimation, based on temperature ranges the striped mollusks find hospitable—32°-90°F—made up by Anthony F. Armor, head of the EPRI Zebra Mussel Task Force. Even he admits that, at most, the shaded area is only a "best estimate" as to their spread throughout North America.

The bright red highlights, on the other hand, show areas where the bivalves have already been found living and causing problems, as reported at the October Electric Utility Zebra Mussel Technology Conference by the Zebra Mussel Information Clearinghouse. Those areas include all five Great Lakes, the Erie Canal, the St. Lawrence River, the Ohio River, the Illinois River and the Hudson River.

Armor further warned of the speed with which the mussels colonized areas such as the Great Lakes, sometimes in quantities of 10,000 or more per square meter, 6-in. and more deep. Even greater concentrations have been found in Europe, up to 100,000/m^2, from where they emigrated to this continent.

A new problem

He noted that one problem had not yet been addressed, namely what might be the effects of mussel shells that had been removed from a power plant and had to be disposed of, most probably in a landfill. The first problem would be filling up the landfill. But the second, and possibly more important one, could be the toxicity the shells might impart to the area.

Utility, government responses

Thomas Maiman, vice president of engineering of Commonwealth Edison, told of his company's thermal treatment to control zebra mussels at its State Line Plant on Lake Michigan. By recirculating water back into the intake bay inside the lake breakwall, he raised the temperature at the plant intakes there to 93°-99°F for 6 hr and achieved a 100-percent kill of the mollusks.

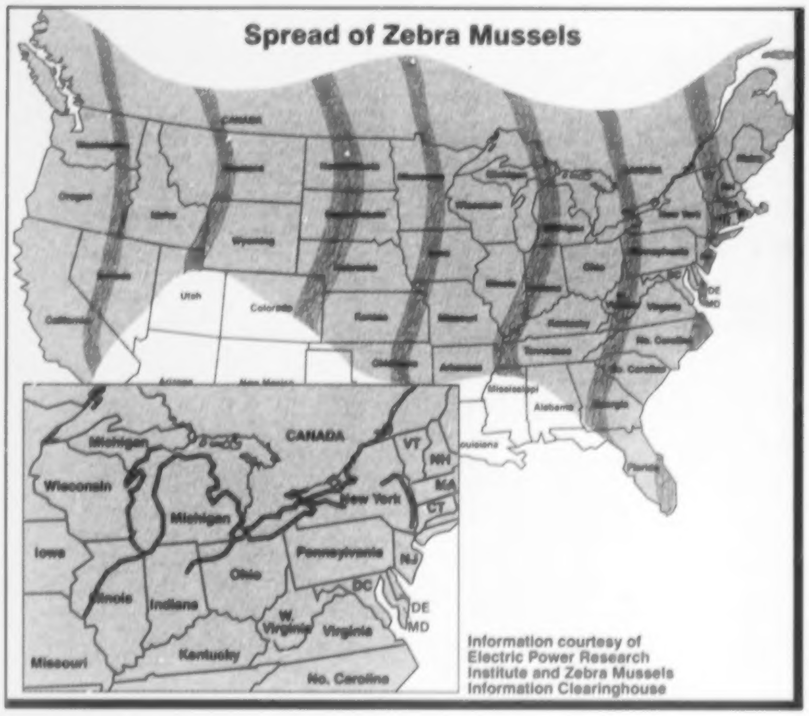
Maiman also pointed out something new that was not in the literature—the effect on the native clam population. Many native clams have become covered with zebra mussels. The native species, he concluded, may be headed for extinction.

Kenith Fenner, of Environmental Protection Agency Region 5, warned that when developing strategies to deal with the mussels utilities should:

- State authorization is needed for introducing new chemicals or biocides. But get the EPA involved, too, since the state authorities are probably going to contact the EPA anyway before authorizing anything.
- Maintain biological water quality standards.
- Do not use unregistered pesticides.
- Consider whether plans meet the idea of "good science."
- Permit requirements are legally binding documents.

A new concept was presented by John Holsapple of Empire State Electric Energy Research Corp. (ESEERCO) who said there was pressure to move away from chemical zebra mussel treatments. He described an acoustic method for breaking the shells of the veligers (the larva stage) in 5-6 sec and those of juveniles in 7 min, and killing adults with 18-hr exposure.

The effects were most lethal to the smaller specimens, but those effects depend on frequency, sound pressure level and time.



Spread of Zebra Mussels

Information courtesy of Electric Power Research Institute and Zebra Mussels Information Clearinghouse

ESEERCO is continuing further research along these lines.

Detroit Edison, on the other hand, uses mechanical cleaning to keep its Monroe Power Plant on western Lake Erie operational. Mussels are removed from trash bars by underwater hydrolasing at 3000 psi. The mussels dislodged drift onto traveling screens that turn continuously during the cleaning operation. Leaf rakes scrape them off the screens for collection and disposal.

In addition, waterboxes are scraped clean with hooked picks, and screenhouses are now mechanically cleaned during scheduled outages. Zebra mussels are removed from walls and basement floors of screenhouses by dewatering and hydrolasing from rubber boats as the water level drops.

That's a lot of mussels!

Three of the four Monroe units were cleaned in late 1989-early 1990. Each cleaning yielded 50 yd^3 of the mussels weighing 15 tons. Cleaning the fourth unit in fall 1990, yielded approximately 100 yd^3 of the mollusks weighing about 30 tons. The overall average cleaning cost is about \$4/yd^2/yr.

William Kovalak, principal biologist, says DE now is looking into various coatings (as is Niagara Mohawk Power) with a view to preventing or minimizing the buildups of the past, and also is experimenting with underwater sandblast spraying, as is done on oil platforms. DE estimates zinc-and-copper or silicone coatings will cost approximately \$12/yd^2.

Kovalak also mentioned DE's experiments, which are continuing, of introducing two fish that eat zebra mussels.

More conferences

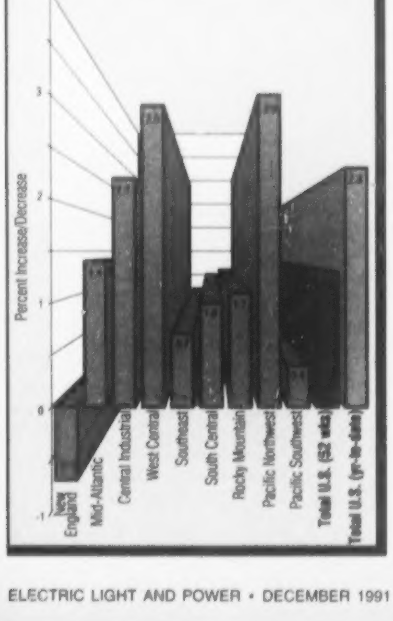
Additional conferences on zebra mussels, the damage they are causing, and how to control them are planned for the near future. The Second International Zebra Mussel Research Conference was to be held in Rochester, NY, Nov. 19-22, and the Second International Zebra Mussel Conference is to be convened in Toronto, on Feb. 19-21.

Plans are to hold the the Electric Utility Zebra Mussel Control Technology Conference at approximately the same time again next year as this year's.

ELECTRIC OUTPUT

Some Growth Slowed

Net electric output from the Mainland U.S. electric utility industry continued its gradual increase for the 52 weeks ending Nov. 1, as reported by Edison Electric Institute. Mild weather in most of the country kept down the rate of increase.



Device installs epoxy linings in inaccessible piping

WEYMOUTH, MA—A unique application device permits installation of 100-percent solid epoxy linings in corroded piping that previously has been inaccessible using conventional methods.

The new equipment is a one-of-a-kind plural application system that can run through as much as 200 ft of straight piping with diameters to 30 in. It can apply a thick restorative lining to corroded pipes, using a remote camera and robotic equipment, located in underground and other normally inaccessible areas.

Previously, serious pipe corrosion called for replacement of the pipe, which, said Tom Gardner, technical services director for Arcor, the supplier of the service, "means big money in terms of direct costs, as well as downtime." The system returns piping to like-new performance.

More information is available from Arcor, 221 Libbey Industrial Parkway, East Weymouth, MA 02189; phone 800/878-9593.

Geothermal is poised on the brink

Ken Nichols, CEO
Mike Forsha, Engineering Manager
Zane International Inc.

BOULDER, CO—Geothermal generating sources have developed so quickly and quietly in the Western U.S. that even some knowledgeable utility people are surprised when they hear of the extent. But development has just begun.

From less than 200 MW of installed capacity in 1970, the total has climbed to more than 2800 MW online today. And worldwide, a 15-percent annual growth rate has persisted since 1978.

At costs of \$1,500-\$2,000 per installed kilowatt, geothermal plants sited on good quality sources are getting cost-competitive with fossil-fuel power plants. In addition, geothermal plants were online an average of over 95 percent of the time, compared to approximately 75 percent for coal and 65 percent for nuclear.

The worldwide growth rate has been driven, to a large extent, by R&D improvements in plant and well technology. In some early plants, high brine levels would scale pipes almost shut, while in others, the brines would severely corrode the equipment.

Another driving force has been government-mandated reduced emissions and other environmental concerns. Compared to a fossil plant, geothermal atmospheric emissions are low, and little pollution control equipment is needed.

In addition, geothermal is the only renewable energy source that does not depend on the vagaries of sun, wind and rain.

Regulatory environment

Regulations over the past several decades have alternately promoted and discouraged development of hydrothermal resources. Under the tax breaks of the Carter Administration in the '70s,

Continued on page 22

Power delivery construction survey shows plans thru 1996

EL&P exclusive report

BARRINGTON, IL—*EL&P's* annual power delivery construction survey indicates utilities are changing their purchasing and construction methods, especially for underground systems.

The results are based on 95 responses from major investor-owned, cooperative, municipal and government electric utilities.

Load growth will be in the range of 2.5 percent with the residential sector growing by 2.1 percent and commercial/industrial by 2.5 percent.

A wide range of voltage levels is in use:

- Interconnections and tielines: 76 percent are rated 115-138 kV.
- Intrasystem transmission: 81 percent are rated 115-138 kV.
- Intrasystem subtransmission: 37 percent are 35 kV.
- Distribution primary voltage is predominantly 15 kV (87 percent).

About 2.3-million miles of overhead transmisssion rated 69 kV and above were in operation in 1991. The responding utilities will add 113,788 miles of overhead transmission lines to their systems during 1992-96. Some 30 percent of the additions were for 138-kV lines. The next highest amount was 20,290 miles of 230 kV (18 percent).

About 15,000 miles of underground transmission lines are in operation by the 95 companies. They plan to add 1800 miles in the next five years. The most dominant underground additions will be for 115 kV, 138 kV and 230 kV.

Almost 11 million miles of overhead distribution lines are in service. By far the predominant voltage is 15 kV (64 percent). Over 7-million miles of this voltage class are in operation. In the next five years, utilities expect to add almost 700,000 miles of overhead lines—mostly in the 15 kV and 25-kV class.

Over 2-million miles of underground distribution lines are operational and plans are being made to add almost 436,000 more in the next five years. Some 52 percent of the additions will be 15 kV and 24 percent rated 25 kV.

The following table indicates the predominant type of underground installation in use today.

	Transmission	Primary Distribution	Secondary Distribution	Services
Conduit	31%	27%	22%	15%
Direct Buried	11%	63%	64%	66%

Plans for future construction of underground distribution indicate more lines will be installed in conduit and fewer will be direct buried.

Respondents were asked about supervisory control and data acquisition (SCADA) and distribution automation (DA) plans. Some 85 percent had SCADA systems in use to some degree. About 80 percent expect to install SCADA systems or add to existing systems.

About 23 percent of the companies had DA systems, but an even higher number—45 percent—said they would have DA systems in the next five years.

The survey asked about the types of towers and poles used by voltage class. Wood, of course, is the predominant type for voltages under 138 kV. For 161-kV lines and above, steel lattice and tubular steel have become more popular.

When asked about the type of insulators in use on their systems, almost 90 percent said porcelain. Only 8 percent used glass and 6 percent used composite insulators. Future construction, however, calls for the use of composite insulators by some 28 percent of the utilities.

ACSR is the predominate type of conductor for overhead lines (60 percent) and will increase to 67 percent for new construction. Aluminum conductor is the predominant type for underground circuits.

Crosslinked polyethylene (XPE) is in use by 75 percent of respondent utilities for underground cable insulation. When asked what they are currently buying, 95 percent said HMWPE, 88 percent said XPE and 35 percent said EPR. Many, of course, buy more than one type of insulation.

The survey also tabulates the number of transformers by voltage class to be ordered in 1992, 1993-95, and 1996-98.

Wayne Beaty, EL&P's Senior Editor-Power Delivery, gave a summary of this report as one of two featured speakers at the "EL&P Marketing Forum," held in Dallas on Sept. 24, during the IEEE/PES Transmission and Distribution Conference and Exhibition. (See related story, p.3.) The audience was primarily marketing executives from major power delivery manufacturing and service companies.

Complete T&D survey results are available from EL&P for 815. Contact Gene Zack at 708/382-2450.

Dates set for 1992 infrared courses

CLEVELAND—American Risk Management Corp. has issued its 1992 listing for Infrared Thermography Training Courses.

Predictive maintenance: Atlanta, Feb. 18-20; Dallas, June 16-18; Sacramento, CA, July 21-23; Atlanta, Sept. 22-24.

Level I: Dallas, Jan. 20-24; Cleveland, March 30-April 3; Atlanta, May 11-15.

Level II: Cleveland, Aug. 17-21; Dallas, Oct. 19-23.

For more info call 216/447-1600.

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ELECTRIC LIGHT & POWER

EL&P

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VOICE OF THE ELECTRIC UTILITY INDUSTRY

Power-Gen looks through '90s

Industry leaders name environment, energy politics among key issues; air, fuel, nuclear technologies emerge

TAMPA, FL—At the 4th International Power-Gen Exposition & Conference, Dec. 4-6, industry leaders noted several recurring themes, including the growth of environmental consciousness and fear that socio-political structures might not allow adequate growth in power-system resources.

About 8000 people attended, from 37 countries, said David Johnson, president, PennWell Conferences and Exhibitions. In four years, it has become one of the world's largest power generation shows. The 467 exhibits covered 85,900 ft^2. In three days, 12 concurrent sessions produced more than 200 papers. *Electric Light and Power* and *Power Engineering* magazines co-sponsored the conference.

Five speakers in the keynote session outlined critical problems and opportunities in the U.S. and Eastern Europe.

"We are in the business of providing electricity, but we're also in the business of preserving the environment," noted Hugh Culbreath, director and former chief executive officer of TECO Energy Inc., who welcomed attendees.

Vito Stagliano, U.S. Department of Energy, expressed DOE's disappointment about the Senate's failure to consider comprehensive energy legislation, S.1220. Stagliano said he would have felt better "if senators had debated the issues and rejected them on their merits. But they didn't even consider them." Stagliano is DOE associate deputy undersecretary, policy, planning and analysis.

William Conway, senior counsel for the Senate Committee on Energy and Natural Resources, said that although the bill returned to committee, "We will win in the end," including reform of the Public Utility Holding Company Act of 1935. Even with more power-system competition, "There will be outstanding reliability," Conway suggested. "If you don't produce the power, you don't get paid. Competition sharpens the mind wonderfully," he added.

David Deieso, president and chief executive officer of Research-Cottrell Co., said perceptions are sometimes more important than facts. "What the public believes, right or wrong, influences public policy. We have to change business culture to match the times.

"It's important for the public to hear that environmental responsibility is good business," Deieso added.

Vitaly Sklarov, minister, Ukrainian Ministry of Power and Electrification, said a major goal for the Ukraine, and other parts of Eastern Europe, is cleaner, safer power generation. This means closing Chernobyl-like nuclear reactors and upgrading other facilities, particularly coal plants.

Main polluter

"The main polluter in the Ukraine is myself," he admitted, speaking for the ministry's power plants. Sklarov was the first Soviet official to get a call from Chernobyl after the 1986 accident.

Continued growth of Power-Gen parallels the industry's expected power-generation expansion

LATE NEWS

Commonwealth Edison Co. approved a revised, 29-year franchise agreement with the city of Chicago on Dec. 12. After rejecting stringent affirmative action rules the city tried to attach, CECo took a revised plan with stronger guidelines than in the original deal, (*EL&P*, 12/91, p.1).
Arizona Public Service received a rate increase Dec. 5, with a 5.2-percent base-rate hike, a $265-million write-off on Palo Verde nuclear plant, and provisions including a customer-supported fund to expand solar energy and energy efficiency programs.
El Paso Electric expressed cautious optimism about securing credit by Dec. 16 to avoid possible bankruptcy protection filing.
Pacific Gas & Electric opened its $7.5-million, 25,000 ft^2 energy efficiency center on Dec. 5.

Forum reports progress toward next nuclear order

SAN FRANCISCO – Funding for first-of-a-kind engineering of the next generation of nuclear designs is nearly complete, announced Sherwood Smith, chairman of the Nuclear Power Oversight Committee (NPOC) at the recent Nuclear Energy Forum here.

For four designs, total funding required is an estimated $1 billion.

NPOC is the nuclear utility organization that announced a new "strategic plan" for building new nuclear plants a year ago at this meeting (*EL&P*, 12/90, p.1), in the wake of the acid rain crackdown on coal-fired plants in the Clean Air Act Amendments of 1990.

The plan's goal is to place an order for a new nuclear unit by 1995 for operation by the year 2000. Funding for first-of-a-kind engineering is the next step toward developing the new designs.

"Utilities and vendors together will match the federal government's $100-million contribution to bring the total effort to $200 million," said Smith, who is also chairman of Carolina Power & Light Co.

"We now have nearly 90 percent of the

Continued on page 6

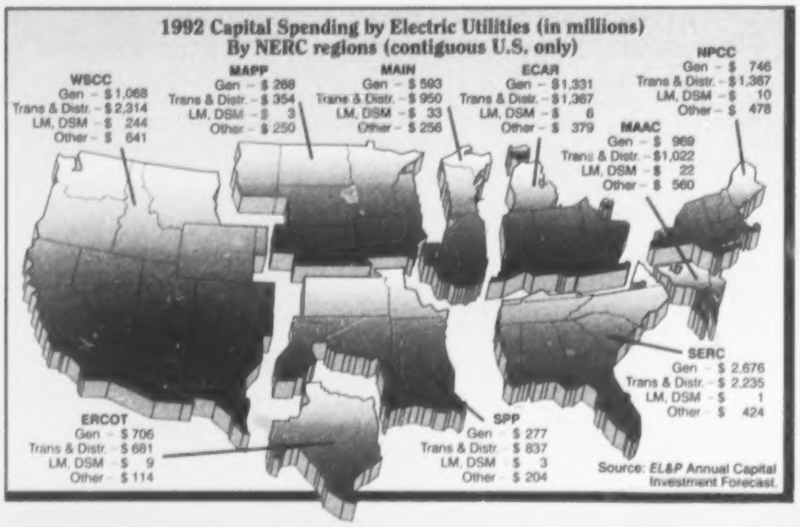
Economy delays spending; surge expected to start in '93

BARRINGTON, IL—Cautions about the sluggish economy has delayed electric utilities' spending surge by a year, but forecasted investments over five years have increased, according to *Electric Light & Power*'s Annual Capital Investment Forecast (see report, this issue).

EL&P's survey shows rapidly increased spending over the next four years, reaching levels higher than forecasted a year ago. Utilities projected a larger five-year total this year, almost $139 B compared to last year's $132 B.

The report provides projections and analysis of five years of electric utility spending and examines the issues reshaping the industry through the eyes of industry leaders.

1992 Capital Spending by Electric Utilities (in millions)
By NERC regions (contiguous U.S. only)



Source: *EL&P* Annual Capital Investment Forecast.

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NEWS BRIEFS

JILL MINNER, Special Projects Editor

ABB, Siemens form alliance for nuclear steam generators

Two international power industry giants are joining forces in an attempt to double their chances at a $2 billion bid for replacing 53 steam generators at U.S. nuclear plants.

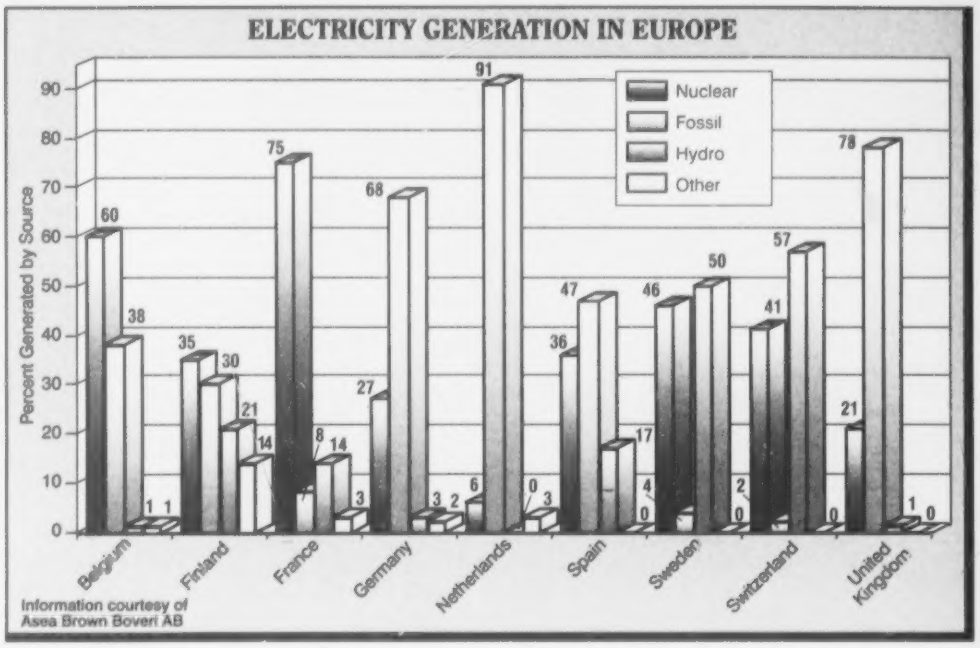
Asea Brown Boveri Inc. and Siemens Nuclear Power Corp. announced intent to form an equally owned U.S. company. Observers were surprised at the Dec. 4, 1991, memorandum of understanding between two traditionally competing companies.

The new company would supply replacement steam generators and related services for plants with pressurized water reactors and offer long-term maintenance services. It would be based in Chattanooga, TN, the present manufacturing center for ABB's subsidiary, Combustion Engineering Inc.

The alliance seems in direct response to the Joint Procurement Corp.'s request for bids on steam generators put out in October 1991 and due Jan. 3. Those 53 steam generators at 10 utilities—about 18 generating units, four or five models—could cost as much as $2 billion, said Nick Santoro, program manager at JPC, based in Birmingham, AL. The work is planned for 1992-2000. He said Westinghouse was the original supplier.

"This is a generic specification with common requirements," said Santoro. "The utilities felt like they could get a better price by working together [through JPC]."

Santoro identified six bidders, as of Dec. 9: Westinghouse, ABB Combustion Engineering, Siemens KWU, Framatome, Voest Alpine, and Babcock and Wilcox. More than one company could get a share of the bids, he added.



Information courtesy of Asea Brown Boveri AB

Average IOU utility pays 22.4% U.S. taxes

U.S. investor-owned electric utilities had a federal tax expense of more than $5.78 billion in 1990, an increase of $500 million over 1989, translating to a tax rate of 22.4 percent, according to Edison Electric Institute. This was twice the average state and local tax rate of all U.S. corporations, EEI said.

Figures were based on a survey of members and eliminated the non-cash accounting earnings item, Allowance for Funds Used During Construction. AFUDC is not considered taxable since it is cash to be received in the future, EEI noted.

DOE aims to expand the natural gas market

The Department of Energy in November announced plans for a joint DOE-National Association of Regulatory Utility Commissioners conference to be held in Phoenix, AZ, Feb. 3-5, to encourage efficiency and expansion of natural gas markets.

Deputy Secretary of Energy W. Henson Moore said in the announcement, "I believe the long-term future of natural gas depends on three key initiatives of the National Energy Strategy: PUHCA reform, pipeline construction reform and an increase in the use of alternative fuels."

Gulf States, Southern end contract dispute

Gulf States Utilities Co. and the Southern Co. formally settled a lengthy purchased-power contract dispute on Nov. 7.

GSU paid Southern $6.6 million cash. Southern also gets $73 million from an escrow account established by the federal court while the contract suit was pending. GSU issued six million shares of common stock to Southern and gave $160 million in promissory notes. GSU's cash outlay in 1991 and 1999 (when notes are due) could total $167 million. Gulf States recorded a second-quarter 1990 after-tax charge of $135 million. This ends the power-sale agreement and litigation.

'92 sales may rebound

The DOE's Energy Information Administration predicted a noticeable rebound in 1992 electricity sales "if the economy rebounds and the temperatures are normal. Despite the recession in 1991, sales were strong because of above normal temperatures during the spring and summer," according to an EIA statement.

Town wants a coal plant

In a non-binding Nov. 5 ballot question, Taunton, MA, citizens voted 55 to 44 percent against prohibiting a proposed 150-MW coal-fired cogeneration project there.

"To the best of our knowledge, this is the first such vote in many years in favor of any major new coal-fired capacity in Massachusetts," said Kenneth P. Roberts, project manager for developer Silver City Energy. A state siting council in early December 1991 was still reviewing the project, in final licensing stages. The circulating fluidized bed technology would provide 500 jobs and $1 million a year in lieu-of-tax payments. Silver City Energy participants are Constellation Energy, U.S. Generating Co. (formerly PG&E/Bechtel Generating) and Cogeneration Services Corp.

Rafters may raise rates on Western area power

Recreational rafting and environmental interests added operating constraints and reduced power output by 30 percent from the U.S. Bureau of Reclamation's Glen Canyon Dam. As a result, utilities in six Western states receiving electricity from Western Area Power Administration incurred an average 11.7-percent rate increase on Dec. 1, '91, and may get another in July or October.

Allowed capacity from Glen Canyon Dam dropped about 400 MW to 950 MW, requiring WAPA and others to use more expensive alternatives. Tri-State Generation and Transmission Association, based in Denver, said the rate increases could double its cost for WAPA power to more than 22 mills per kilowatthour, raising costs by $8.5 million in '92. Increases vary by utility; other affected states are: AZ, NM, NV, UT, and WY.

CIRED establishes permanent office

The International Conference on Electricity Distribution (CIRED) established a permanent office in Belgium, according to H. Wayne Beaty, publicity director for the U.S. CIRED Liaison Committee and *EL&P*'s senior editor—power delivery.

The 11th international conference, for the design, construction, and operation of distribution systems, will be April 22-26 in Liege, Belgium. The office location is CIRED General Secretariat, Galerie Ravenstein, 4, Bte 6, B-1000 Bruzelles, Belgium; phone 32 2 511 1970; fax 32 2 511 2938.

Virgil G. Rose, of Pacific Gas & Electric and the chairman of the U.S. CIRED Liaison Committee said, "I believe this is a significant development in advancing CIRED as the authoritative distribution conference in Europe."

DOE, ComEd grants to strengthen nuclear engineering programs

The U.S. Department of Energy and Commonwealth Edison Co. announced that they will take part in a $500,000 pilot program to help a group of university nuclear engineering departments strengthen their academic programs relating to nuclear fission. As part of the program, DOE and ComEd will provide matching grants totaling up to $100,000 for each school's nuclear engineering department.

"This new partnership between private industry and government should serve as a model for other nuclear utilities and organizations interested in joining DOE in similar matching grant programs," said ComEd Chairman James J. O'Connor.

ComEd has nominated five universities to receive the first grants, they are: University of Illinois at Champaign-Urbana; Massachusetts Institute of Technology at Cambridge; University of Michigan at Ann Arbor; Purdue University, West Lafayette, IN; and University of Wisconsin-Madison.

To qualify for the matching grants, each department must submit an application describing how they would use the grant money and then provide annual progress reports reviewing fund allocations.

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PE T-line use depends on decision after EMF hearings

PHILADELPHIA—In a hearing about operating a nearly completed, $19.8-million, 230-kV Philadelphia Electric transmission line, three medical experts testified that resulting electric and magnetic fields (EMF) would pose no threat to human health.

Even with a negative regulatory outcome, PE doesn't expect to abandon the project, saying it would appeal any ruling preventing the line's use.

About nine hearings were held from August through at least December before an administrative law judge (ALJ) for the Pennsylvania Public Utility Commission. The ALJ will make recommendations to the PUC, which will decide if PE can operate the line.

Residents near the 12.8-mile line requested the hearings, primarily on EMF, after regulatory approvals were already given, claiming they weren't properly notified of the project. A state court remanded the issue back to the PUC to consider the EMF-human health issue. Any effect on property values is not to be considered.

"My overall conclusion is that there is no basis to conclude that power frequency electric and/or magnetic fields have adverse effects on the health and function of the endocrine or immune systems," said Dr. Richard Bockman, who holds an MD from Yale University, a Ph.D. in biochemistry from Rockefeller University.

Dr. Philip Cole testified, "Taken together, the epidemiological reports fail to demonstrate any strong or consistent pattern of association between EMF and cancer among human beings.

"Indeed, even among the positive studies, findings are not supported by the internal characteristics of the data. The summation can only be that, to date, there is no demonstrated relationship between EMF and cancer in human beings," said Cole, who holds a masters and doctorate of public health in epidemiology from Harvard University, and is a professor in that area in a cancer center at the University of Alabama.

On the line

The line between PE's Woodbourne and Heaton substations was nearly completed in late November 1991 "and will be ready to be energized in the spring of 1992," the utility noted in a statement. The line is to accommodate rapidly expanding electrical needs and assure service reliability for growing customer demand in Bucks and Montgomery Counties.

The line's right-of-way is about 100 feet from the nearest house, but 200 or more feet away from most houses, according to PE spokesperson Bill Jones. A group of about 150 people are protesting, he added. The utility purchased the right-of-way and existing deenergized 138-kV line from a railroad in 1989 for $3 million and notified municipalities as state regulations require.

"If we don't get this operating, we may be looking at severe reliability problems. The need is there," said Jones.

EMF/cancer study results supply no direct answer

PALO ALTO, CA—Findings from an EMF/cancer study sponsored by the Electric Power Research Institute showed a lack of consistent association between childhood leukemia risk and direct measurements of electric or magnetic fields (EMF).

Preliminary results, reported in *EL&P*, 3/91, p.1, seemed consistent with the final report, published in the Nov. 1, 1991, American Journal of Epidemiology.

The study offered some support for a relationship between household wiring configurations or children's use of electrical appliances and leukemia risk.

EPRI urged further research. The study covered 232 children under 11 years of age with leukemia in Los Angeles County and relied on memory for documentation of appliance use. A University of Southern California researcher conducted the study.

NERC winter peak increases 7.6%; new facilities added

PRINCETON, NJ—This winter, U.S. peak electric demands are expected to increase 8.1 percent, while Canada's peaks will rise 4.8 percent, according to the "NERC 1991/92 Winter Assessment." Overall, the North American Electric Reliability Council expects a 7.6-percent increase for the period.

Generating capacity and fuel supplies are generally adequate, but some transmission facilities will near their limits as some utilities use systems to optimize economic transfers in eastern ECAR, MAAC and a part of SERC, NERC said.

"In addition, new jointly planned shunt capacitor banks recently installed in eastern ECAR have improved overall system voltage and reliability during heavy west-to-east transfer," NERC reported.

Southeast shows largest gain

The region reporting the highest gain in projected peak demand is SERC with 13.6 percent, citing a mild 1990/91 winter. WSCC was the only region with a lower peak, dropping 2.9 percent from last year. WSCC noted that the 1990/91 peak was reduced by use of direct load management and interruptible demand contracts during colder-than-normal temperatures.

Only Ontario Hydro said reserve margins are forecast to be lower than desired, adding that purchases may be required to supplement reserves.

During the three winter months, expected generation additions number more than 16, including the following units over 300 MW: Darlington nuclear unit No. 1, 881 MW, December 1991, in NPCC; LG 2A No. 23, 316 MW, hydro, December 1991, in NPCC; and AES Shady Point, 320 MW, steam/coal, January 1992, in SPP.

Two of eight transmission upgrades 230 kV and above include: J.K. Spruce-Cagnon Road (double circuit) 37.4 miles, 1206 MVA capacity, 345 kV, December 1991, in ERCOT; and Kanawha River-Matt Funk, series capacitors 178 MVA, shunt capacitor banks rated in Mvar, 230 kV, January 1991, in ECAR.

The data, provided by the regional reliability councils, covers December 1991 through February 1992.

Councils

The councils mentioned are: East Central Area Reliability Coordination Agreement (ECAR), Mid-Atlantic Area Council (MAAC), Southeastern Electric Reliability Council (SERC), Western Systems Coordinating Council (WSCC), Northeast Power Coordinating Council (NPCC), Southwest Power Pool (SPP), and Electric Reliability Council of Texas (ERCOT).

For more information, contact NERC, 101 College Road East, Princeton, New Jersey 08540-6601; (609) 452-8060.

SUPPLY AND DEMAND OF ELECTRICITY IN CANADA

	1989	2000	2010
Generating Capacity (MW)[a]	**103719**	**121265**	**140847**
Domestic Peak Demand[b]	82489	92692	107257
System Peak Demand[c]	88933	101509	118956
Remaining Capacity	14786	19756	21891
Percent of System Peak	17	19	18
Generating Capacity by Fuel Type (MW)[d]			
Hydro	57470	66275	78602
Coal	16954	18793	20018
Nuclear	11229	14528	16560
Oil	5502	5521	5654
Natural Gas	2522	2779	2845
Other	3516	5231	6798
Energy Production (TWh)	**483**	**585**	**671**
Hydro	288	359	411
Coal	86	96	114
Nuclear	75	105	113
Oil	17	9	13
Natural Gas	14	12	16
Other	3	4	4
Domestic Consumption (TWh)	**473**	**543**	**630**
Gross Exports	**18.5**	**45.3**	**46.8**

Numbers have been rounded.

[a] Generating capacity in this table includes purchased capacity.

[b] These numbers are the sum of provincial peak demands, which are not necessarily coincident peaks. To this extent, remaining capacity and percent of system peak values may be understated on a national basis.

[c] System Peak Demand total includes Domestic Peak Demand amount for Newfoundland rather than system peak demand because of a large sales component to Quebec which would otherwise be double counted.

[d] Note that this excludes purchased capacity.

Source: "National Energy Board Canadian Energy Supply and Demand 1990-2010."

State regulators support clean-air details, promote gas cooling

SAN ANTONIO, TX—State regulators resolved to help clean-air amendment compliance and promote the use of natural gas for cooling and humidity control, at the 103rd Annual Convention of the National Association of Regulatory Utility Commissioners held here in November.

In other action, Kenneth Gordon, of the Maine Public Utilities Commission, succeeded William D. Steinmeier, of the Missouri Public Service Commission, as NARUC president.

Among the resolutions, NARUC:

- Supported market mechanisms offered by third parties to promote an efficient and successful sulfur-dioxide emission allowance trading market. It encouraged states to consider adopting policies to allow their jurisdictional electric utilities to use market mechanisms when the commission finds it appropriate and in ratepayers' interest.
- Promoted formation and use of bonus SO_2 allowance pools to share the risks and rewards when the extra allowances are allotted. If all eligible utilities ask for the expected extra allowances there won't be enough to go around, likely prompting a first-come first-served telephone call-in to award them. Generating companies joining together in a pool can share any rewards, while dividing the risk. NARUC discouraged states from penalizing participation in such pools.
- Recommended that gas utilities promote gas cooling in short- and long-term resource planning, that NARUC members support additional research for gas cooling, and encourage local gas utilities and pipelines to develop programs to advance efficient and economical gas cooling and humidity control as appropriate for the state or service territory.
- Stated that Securities and Exchange Commission policy should not preclude the Federal Energy Regulatory Commission or states from exercising lawful ratemaking authority. NARUC said that the SEC has deemphasized its administration of the Public Utility Holding Company Act by calling for repeal of the law and reducing resources devoted to utility regulation. NARUC also expressed concern that current legislation would exempt wholesale power generators from PUHCA through FERC review of wholesale power sales. Litigation between FERC and SEC has caused uncertainty, NARUC added.

Kenneth Gordon
NARUC president

- Resolved to cosponsor, with the Automatic Meter Reading Association, automatic meter technology and remote access information and control seminars. NARUC declined to help financially, but asked that its committee on finance and technology have advanced approval of program content and seminar procedures to protect NARUC interests. That committee is to report developments back to the executive committee.

Oglethorpe Power's load management saves $14.5M

TUCKER, GA—Oglethorpe Power Corp. and member systems claimed savings of more than $14.5 million during 1991 for consumers through load-management efforts.

The savings, in purchased power and transmission investments, resulted from a statewide network of more than 328,000 radio-controlled load management switches coordinated through OP's system control center.

Electric water heaters, heat pumps, central air conditioners, and irrigation pumps are connected to OP-controlled switches in a voluntary and free program to cut peak electricity demand.

Heat pumps and air conditioners are cycled off for 7.5 minutes each half hour; water heaters usually are turned off for longer periods.

COMMENTARY

Greetings to EL&P readers

I would like to use the "Commentary" space this month to say hello to all my old friends at *Electric Light & Power* and to readers who may remember me from my previous tenure here. In case you haven't heard the news yet, Bob Lincicome has retired as editor of *EL&P* and I have been named to replace him. In a way I'm coming back home because I worked for *EL&P* for 15 years before leaving in 1986. When I left *EL&P*, I didn't leave the electric utility industry. I have been editor of *Power Engineering* magazine for the past six years. For those of you not familiar with *Power Engineering*, it covers the power generation industry – both utilities and non-utilities. Now I am editorial director of both magazines. What does that mean for *EL&P* readers? I hope it means that in the future you will like the magazine even more than you have in the past.

Bob Lincicome and his staff have built a strong and loyal readership and I hope I can build on that. Will *EL&P*'s editorial emphasis change? No, it won't. The magazine will continue to be the voice of the utility industry. It will continue to cover the entire scope of the utility industry. It will continue to be published in a tabloid, news format with a strong emphasis on technical developments in addition to covering the news. How can a monthly magazine cover the news? *EL&P* may not be the first place you see coverage of an event in our industry or affecting our industry, but it should be the place you see the most complete and insightful coverage. The significance of national events should be a lot clearer to you after you've read about them in *EL&P*.

How will the magazine's editorial policy and attitude change? In this "commentary" space we will attempt to be the utility industry's strongest defender and most articulate critic. We have no hidden agenda. We have only our own sense of what is best for the industry. I'm using the word "we" to refer to the entire staff. I plan to make this space available to others on the staff to express their opinions.

The "letters" section on this page belongs to you. We welcome your comments, ideas, and suggestions and will publish them when they are of interest to our readers. That includes disagreement with our opinions or our version of the facts. My policy is to publish opposing points of view, corrections, and disagreements without editorial rebuttal. The purpose of that is to encourage you to write to us, whether it's pro or con. The best way to approach the truth is to publish as many responsible points of view as possible. I can not promise to strictly maintain past points of view on industry issues as expressed in *EL&P*. First, I have my own opinions which may not always agree with those of my predecessor and, second, my opinions tend to change as I learn more about issues. I can only promise to attempt to give you enough of the facts and reasoning behind the opinions expressed here so that you can judge their validity for yourself.

Let me give you an example. As editor of *Power Engineering* over the past six years I have observed and reported on the rise of the non-utility power generation industry. I have walked a fine line between the conflicting interests of my utility and non-utility readers. However, I have come to recognize the valuable contribution being made by non-utility power and to value the new spirit of competition it has brought to the entire industry. I have urged more open access to utility transmission systems to accommodate the growth of non-utility power.

Now I find myself as editor of a utility publication. I am not going to change my opinion on transmission access merely because of my change in title. However, I do promise to keep an open mind and I reserve the right to refine my position as I learn more about the utility side of this issue – as I undoubtedly will.

Thank you for your readership. I hope it will continue. I hope we continue to serve your needs. If you have any suggestions, let me know.

Robert Smock, Editorial Director

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DSM worksheet: Check the regulatory incentives in each state

WASHINGTON—Recovery of demand-side management (DSM) related lost revenues and provisions for shareholder incentives on DSM figure prominently in states' efforts to remove disincentives and provide positive incentives for DSM.

Check list

Using the table below, check off the provisions your state has in place.

☐ 1. State has no formal actions to provide lost revenue recovery and/or shareholder incentives.
☐ 2. State is developing incentives through formal proceedings.
☐ 3. State has incentives in place.

Some state regulations allow DSM program cost recovery through:

☐ 4a. A balancing account. This is a rate mechanism that reconciles, with interest, a utility's collections from ratepayers for DSM to its actual expenditures. Its use allows utility recovery of full DSM expenditures and ensures no profit is gained by underspending the DSM budget.
☐ 4b. Ratebasing. As with supply-side resources, this allows utilities to capitalize and amortize expenditures and earn a return on the investment during the amortization period.

Lost revenue recovery offsets the decrease in base revenues attributable to DSM programs. It can be achieved by:

☐ 5a. Recovery of the estimated amount of lost base revenue specifically attributed to DSM.
☐ 5b. A mechanism to automatically adjust base revenue to an authorized amount, eliminating revenue fluctuations due to weather, general economic conditions, DSM, or sales promotions. These are often called "ERAMs" after California's Electric Revenue Adjustment Mechanism.

Types of shareholder incentive mechanisms include provisions so that utilities may:

☐ 6a. Receive a percentage markup on certain DSM expenditures.
☐ 6b. Be eligible to earn a greater-than-normal return on equity for rate-based DSM expenditures.
☐ 6c. Have overall return on equity re-adjusted in response to quantitative or qualitative DSM performance measurements.
☐ 6d. Receive a percentage share (gross and/or net) attributable to DSM programs.
☐ 6e. Get a specific bonus amount for each kilowatt and/or kilowatthour saved through DSM.

☐ 7. DSM shareholder incentive mechanism is in place. Where incentives are specific for a utility, that utility is named.

This data was prepared by Barakat & Chamberlin for the National Association of Regulatory Utility Commissioners' Subcommittee on Incentive Regulation and Rate Design in November '91.

More information

For more information, contact NARUC, (202) 898-2200, facsimile (202) 898-2213.

State regulatory influence on demand-side management

Alabama 1
Alaska 1
Arizona 3 by generic commission order
Arkansas 1
California 3, 4a, 4b, 5b, 6a, 6d, 7—Pacific Gas & Electric, San Diego Gas & Electric, Southern California Edison, Southern California Gas
Colorado 3, 4b, 6d, 7—Public Service Co. of Colorado
Connecticut 3, 4b, 5a, 6b, 7—United Illuminating
District of Columbia 3—regulatory changes recently occurred, 4b, 5a, 6d, 7—Potomac Electric Power
Delaware 1
Florida 2, 4a, 4b
Georgia 2
Hawaii 2, 4a
Idaho 3—by generic commission order, 4b, 6c
Illinois 1, (4a, 5a for two utilities' DSM research and pilot programs, but not for full-scale programs)
Indiana 3—regulatory changes recently occurred, 5a, 6d, 7—PSI Energy
Iowa 3—by generic commission order, 6d
Kansas 3—by statute, 6b
Kentucky 1
Louisiana 1
Maine 3, 4a, 4b, 5b, 6d, 7—Central Maine Power
Maryland 3, 4a, 4b, 5a, 6d, 7—Potomac Electric Power
Massachusetts 3-mechanisms vary, 4a, 4b, 5a, 6e, 7—Massachusetts Electric, Western Massachusetts Electric
Michigan 3—mechanisms vary, 4a, 4b, 6c, 6e, 7—Consumers Power
Minnesota 3, 4b, 5a—Northern States Power (NSP) may recover 50% of any interruptible rate discounts it offers which fall above levels built into the 1991 test year. Midwest Gas may recover some costs, 7—NSP.
Mississippi 1
Missouri 1
Montana 3—by statute, 4b, 6b
Nebraska 1
Nevada 2, 4b
New Hampshire 3, 4a, 5a—recovery of lost revenues allowed, but utility must propose mechanisms, 6d, 7—Granite State Electric
New Jersey 3—by generic commission order, 5a—recovery of lost revenues allowed, but utility must propose mechanisms, 6d, 6e
New Mexico 2
New York 3—features vary, 4a, 4b, 5a, 5b, 6c, 6d—Central Hudson, Consolidated Edison, Long Island Lighting Co., New York State Electric & Gas, Niagara Mohawk Power, Orange & Rockland, Rochester Gas & Electric
North Carolina 2
North Dakota 1
Ohio 3—by generic commission order, 4a, 5a, 6d
Oklahoma 1, 4b
Oregon 3, 4b, 5a, 6d, 7—Portland General Electric
Pennsylvania 2, 4b
Rhode Island 3, 4a, 6d, 7—Narragansett Electric
South Carolina 1
South Dakota 1
Tennessee 1
Texas 3—by statute, 4b, 6c
Utah 1
Vermont 2—by generic commission order, 4a, 4b, 5a, 6d
Virginia 2
Washington 3—by statute, considering a settlement agreement for a Puget Power shareholder incentive mechanism, 4a, 4b, 5b, 6b
West Virginia 1
Wisconsin 1—commission has experimented with shareholder incentive mechanisms but none is in effect, 4a, 4b
Wyoming 1

Utility capital spending surge slated for 1993

Caution of sluggish economy delays spending boom by 1 year

EL&P's Annual Capital Investment Forecast
This exclusive EL&P annual report provides projections and analysis of electric utility spending over the next five years, as well as a look at the issues, events and trends reshaping the industry.

Robert Smock
Editorial Director

It looks like 1993 will be the kickoff year for utility capital spending, according to the latest annual survey of utility spending plans conducted by *Electric Light & Power*.

A surge in spending in the '90s has been foreseen for several years, driven by the need for new capacity and associated transmission systems.

In last year's survey, the onset of the surge was expected to be 1992. However, now it looks like it will be set back one year, probably reflecting utility caution in the face of the sluggish economy. Spending is expected to jump significantly in 1993 to $27 billion (see Table 1) and again in 1994 and 1995 to almost $30 billion in each year.

The new survey shows total outlays reaching only $23 billion in 1992, down substantially from the $27 billion predicted a year ago. However, spending rapidly increases over the next four years, reaching levels in the mid-90s much higher than forecasted a year ago.

The dropoff in 1996 reflects uncertainty about five years in the future more than a prediction for a decline in capital spending. Utility capital spending will probably increase throughout the entire decade.

The beginning of the upswing may be delayed, but it's still expected. In fact, utilities projected a larger five-year total this year, almost $139 billion, compared to last year's $132 billion.

Even though the five-year total is increasing, *EL&P's* survey does not yet fully reflect the anticipated surge in capital spending for new generating capacity that is widely expected. As can be seen in Table 1, spending for generation is expected to rise over the forecast period, but peak out in 1994.

Other industry observers such as the U.S. Dept. of Energy expect a substantial increase in the rate of power plant additions over the next 20 years – a significant change from the pattern of the last 10 years. DOE predicts that in the 1990s utilities will add from 73 GW to 104 GW of new capacity, much of it not yet under construction or even ordered. That will require sustained increases in generation spending throughout the 1990s.

Table 1. Five-Year Capital Spending
(In millions of $)

Year	Gen.	Substa.	Trans.	Dist.	LM/DSM	Other	Total
1992	8,634	1,528	2,967	6,631	331	3,306	**23,396**
1993	10,889	1,510	3,480	7,329	395	3,553	**27,157**
1994	11,948	1,612	3,603	8,208	530	3,912	**29,812**
1995	11,438	1,461	3,960	8,462	657	3,983	**29,960**
1996	10,666	1,421	3,725	8,219	287	4,076	**28,394**
Total	**53,574**	**7,531**	**17,734**	**38,869**	**2,200**	**18,830**	**138,739**

Table 2. Five-Year Patterns of Capital Spending

	1992	1993	1994	1995	1996
Generation	36.90%	40.10%	40.08%	38.15%	37.56%
T&D	47.55%	45.36%	45.03%	46.37%	47.07%
LM/DSM	1.42%	1.46%	1.78%	2.19%	1.01%
Other	14.13%	13.08%	13.12%	13.29%	14.36%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

EL&P's survey of the electric utility industry covers all types of utilities: investor-owned, municipal, co-op, federal and other public organizations. It was completed in November 1991. Data was obtained from utilities in all regions of the North American Electric Reliability Council and was projected to represent total industry spending.

As shown in Table 1, generation spending is expected to total almost $54 billion over the forecast period, the largest single category. The second largest category is distribution, where spending is expected to rise for the next four years, reaching a total of $39 billion.

Capital spending on transmission systems is also expected to rise through much of the forecast period, reflecting the increase in generation spending. Spending on transmission is expected to approach $4 billion in 1995 and total $15 billion over the forecast period. Spending on substations is expected to remain relatively flat throughout the period, about $1.5 billion.

A new category was added to this year's survey: load management/demand-side management. Capital spending in this area is expected to more than double from 1992 to 1994, rising from $331 million to $657 million; other predictions have shown even higher estimates.

Table 2 shows the trend in spending patterns. Generation rises in importance over the next three years, and load management/demand-side management increases its share for the next five years. The power delivery share remains fairly steady.

Capacity addition plans

In this year's survey, 98 utilities reported their capacity addition plans, up substantially from the 72 companies reporting such plans last year. Table 3 shows the year these companies anticipate needing their next new unit of capacity. The pattern clearly shows a heavy need in the middle of the decade. In addition, many companies anticipate heavy needs after the turn of the century.

As shown in Table 4, construction on these new planned units will start next year and run at a strong pace at least through the middle of the decade.

The type of new unit to be added is shown in Table 5. It shows that 78 percent of the new units will be either gas turbines or combined cycles. Only eight new base-load steam units, three hydro, and nine "other" types showed up in this survey.

The unit size distribution of the new units is shown in Table 6. Half of the new units will be less than 100 MW in size, clearly indicating that they will be gas turbine peakers. Probably most of the 100-MW units will be gas turbines, too.

Table 7 confirms the dominance of gas-turbine capacity in current planning. It shows that oil and gas account for the bulk of new units being planned. Only 5 new coal-fired units are indicated.

Respondees also told *EL&P* that more than 23 GW of new capacity needs has been avoided or delayed through load management or demand-side management programs. They also indicated that an additional 24 GW of new capacity requirements will be satisfied through contracts with non-utility power producers.

Capital spending on existing capacity was also covered in the survey. Respondees said they planned life extension programs (23%), uprating programs (21%), modification projects (23%), and other types of activities (31%) at older plants.

Table 3. Year Anticipate Needing New Capacity

1991	2
1992	10
1993	6
1994	17
1995	10
1996	7
1997	6
1998	4
1999	6
2000	4
>2000	26

Table 4. Year Anticipate Initiating Construction of New Capacity

1991	2
1992	11
1993	10
1994	5
1995	13
1996	7
1997	6
1998	3
1999	5
2000	2
>2000	2

Table 5. Likely Type of Unit to be Added

Base Load Steam	8
Combustion Turbine	49
Hydro or Pumped Storage	3
Combined Cycle	23
OTHER	9

Table 6. Probable Size Next Capacity (MW)

<100	41
100	18
200	9
300	5
400	4
>500	3

Table 7. Probable Fuel For Next Unit

COAL	5
OIL	15
GAS	68
OTHER	6

Regional patterns

Regional spending patterns are shown in the following tables. Starting at the top, utilities in the East Central Area Reliability Council (ECAR) plan to spend $18.7 billion over the five-year forecast period, an 8-percent increase from the level shown in last year's survey. Increases are shown in both generation and power delivery spending plans. ECAR utilities plan heavy levels of capital outlays in 1993 and 1994 for new generation, with spending on power delivery programs rising throughout the period.

East Central Area Reliability Council (ECAR)

	Gen.	T&D	LM/DSM	Other	Total
1992	1,331	1,367	6	379	**3,083**
1993	1,820	1,599	6	384	**3,808**
1994	1,844	1,790	9	408	**4,051**
1995	1,498	1,889	14	349	**3,749**
1996	1,604	2,191	20	242	**4,058**
Total	**8,097**	**8,835**	**56**	**1,762**	**18,749**

Mid-Atlantic Area Council (MAAC)

	Gen.	T&D	LM/DSM	Other	Total
1992	969	1,022	22	560	**2,573**
1993	1,153	1,090	22	530	**2,795**
1994	1,331	1,193	23	585	**3,131**
1995	1,379	1,351	23	692	**3,445**
1996	1,400	1,626	32	502	**3,559**
Total	**6,231**	**6,282**	**121**	**2,869**	**15,503**

Utilities in the Mid-Atlantic Area Council (MAAC) plan to spend $15.5 billion over the five-year period, a 6-percent increase over the level predicted a year ago. The mid-Atlantic utilities foresee steadily rising spending on generation, power delivery, and load management throughout the forecast period. Compared to the last survey, they have increased power delivery spending and slightly decreased generation plans.

Industry leaders discuss top concerns of next 5 years

DSM, T-Access, PUHCA Reform, NES, Externalities, EMF

Electric utility industry trends, technology, regulation and policy are rapidly changing. Here's a look at some of the key issues and how they'll be reshaping decision-making over the next five years, and beyond.

National energy policy

Linda Stuntz
Department of Energy

Linda Stuntz, of the U.S. Department of Energy, says the National Energy Strategy offers market flexibility. Alternate plans proposed, outside of present legislation, rely heavily on carbon taxes. One extreme case would cost an estimated $300 billion per year to comply, Stuntz says, which would be very detrimental for jobs and the gross national product.

Stuntz is the DOE deputy undersecretary for policy planning and analysis, and acting assistant secretary for fossil energy.

Stuntz expects to be part of a September '92 conference committee that will work out the differences in the Senate and House versions of comprehensive energy legislation. That prediction comes despite the Senate's refusal to consider S.1220 (*EL&P*, 12/91, p.1).

The administration has done and will continue to "implement the balanced and comprehensive initiatives set forth in the National Energy Strategy, and we will continue to do so, with or without Congress," Stuntz says. "Energy and environmental challenges are best met by relying to the greatest extent possible on market forces," contends Stuntz.

The NES encourages greater dialogue between federal and state regulators and among federal agencies. Initiatives expected in coming months include model building efficiency standards and a Federal Energy Regulatory Commission (FERC) notice of proposed rulemaking on market-based pricing of electricity.

Externalities

Stuntz calls externalities – the practice of assigning environmental, societal and other values to resource decision-making – "one of the key energy issues of the '90s." Even though a number of states have developed or are looking at rules, "I haven't seen anything credible enough to base energy procurement on," Stuntz adds.

Clean-air rules, regulations

State regulators generally praise the U.S. Environmental Protection Agency (EPA) for drawing all involved parties into the rulemaking process through activities and recommendations of the Acid Rain Advisory Committee.

William G. Rosenberg, assistant administrator for air and radiation at the EPA, says that in 1991 through November, the EPA proposed 35 clean-air rules and finalized nine. Rosenberg characterizes the participatory process as a desire to "negotiate now, rather than litigate later." Rosenberg adds that the rules allow utilities to choose the most economical way to comply, which will help both ratepayers and utilities in the future.

Brian J. McLean, acting director, EPA Acid Rain Division, praises the market-based flexibilities built into the Clean Air Act Amendments of 1990. Much of McLean's view of the next five years involves setting CAA rules for the 1995 and 2000 deadlines and monitoring compliance. As expected, EPA recently released more than 1100 pages of "acid-rain" rules to reduce SO_2 emissions by 10-million tons by the year 2000, about halving 1980 levels. A rule on the allowance auction and sale was expected by the end of November.

McLean says the industry has to "find ways to integrate environmental problems into financial decision making." He also encourages regulators to establish guidelines for how they treat utilities' compliance strategies.

Allowance trading is going to work as part of the Clean Air Act, Stuntz predicts. Because of uncertainties, some utilities will overcontrol, however. Utilities will need to develop regulatory relationships in advance if they're going to send the right benefits to ratepayers, she adds.

McLean praises utilities and states with an integrated resource planning (IRP) process in place, calling the IRP a "perfect fit," since it "balances the supply and demand sides" and accounts for all compliance

Electric Reliability Council of Texas (ERCOT)

	Gen.	T&D	LM/ DSM	Other	Total
1992	706	681	9	114	1,509
1993	708	696	13	130	1,547
1994	287	459	21	131	898
1995	252	446	24	147	869
1996	477	730	47	201	1,455
Total	2,429	3,011	114	723	6,278

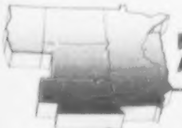
The Electric Reliability Council of Texas (ERCOT) utilities report a lower level of spending in this year's survey, $6.3 billion over the five-year period, which is down 21 percent from the level predicted a year ago. Generation spending over the five-year period is down from $4.6 billion to $2.4 billion, while power delivery spending stayed relatively flat. ERCOT utilities are planning little new generation after the gas-turbine surge of the next two years. Load-management spending is expected to rise at a rapid rate, from $9 million in 1992 to $47 million in 1996.

Mid-America International Network (MAIN)

	Gen.	T&D	LM/ DSM	Other	Total
1992	593	950	33	256	1,832
1993	603	1,046	36	301	1,986
1994	649	1,072	40	341	2,103
1995	628	1,100	40	224	1,991
1996	518	385	59	184	1,147
Total	2,992	4,553	208	1,307	9,059

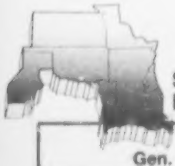
The Mid-America Interpool Network (MAIN) reported spending plans over the five-year forecast period for $9 billion, up 12 percent from last year's survey. The big increase is concentrated in the power delivery area, up to $4.6 billion from $4.0 billion, and "other" including load management. There was a slight decline in generation plans.

Utilities in the Mid-Continent Area Power Pool (MAPP) plan to spend $4.4 billion over the next five years, up a whopping 16 percent from the level reported a year ago. Generation spending will rise to a total of $1.6 billion and power delivery spending to $1.9 billion. MAPP utilities are not, however, much interested in load management with spending plans at a minimal level over the next five years compared to other regions.



Mid-Continent Area Power Pool (MAPP)

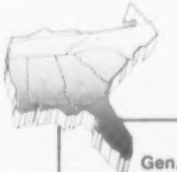
	Gen.	T&D	LM/ DSM	Other	Total
1992	268	354	3	250	874
1993	348	378	1	183	911
1994	258	384	2	197	841
1995	247	381	2	178	808
1996	442	403	2	151	999
Total	1,564	1,900	10	959	4,433



Southeast Power Pool (SPP)

	Gen.	T&D	LM/ DSM	Other	Total
1992	277	837	3	204	1,321
1993	398	934	4	210	1,546
1994	439	1,068	5	217	1,729
1995	514	1,088	5	252	1,859
1996	369	1,419	4	368	2,159
Total	1,997	5,346	20	1,251	8,615

The Southwest Power Pool (SPP) plans spending of $8.6 billion, up 3 percent. Generation spending is expected to double over the next four years, rising from $277 million next year to $514 million in 1996. Power delivery spending is expected to rise substantially throughout the forecast period.



Southeast Electric Reliability Council (SERC)

	Gen.	T&D	LM/ DSM	Other	Total
1992	2,676	2,235	1	424	5,336
1993	3,613	2,441	1	510	6,564
1994	4,566	2,843	1	530	7,940
1995	4,228	2,967	1	634	7,831
1996	3,530	2,335	2	1,319	7,186
Total	18,613	12,821	7	3,417	34,857

Utilities in the Southeast Electric Reliability Council (SERC) have cut their five-year spending projection by 8 percent, down to $34.9 billion in the current survey. Spending is down in both generation and power delivery. This is another area where load management is not particularly popular, with spending plans running at the level of only about $1 million a year – and this is the largest electric reliability council in terms of total capital spending.

Northeast Power Coordinating Council (NPCC)

	Gen.	T&D	LM/ DSM	Other	Total
1992	746	1,367	10	478	2,601
1993	870	1,462	12	537	2,881
1994	853	1,660	14	581	3,108
1995	783	1,677	15	600	3,075
1996	393	886	13	209	1,501
Total	3,646	7,051	63	2,405	13,165

The Northeast Power Coordinating Council (NPCC) plans total spending of $13.2 billion, up 0.5 percent from the year-ago level. Both generation and power delivery plans have declined, but a substantial increase is planned in the "other" category.

Western States Coordinating Council (WSCC)

	Gen.	T&D	LM/ DSM	Other	Total
1992	1,068	2,314	244	641	4,267
1993	1,376	2,674	301	769	5,119
1994	1,720	2,954	414	922	6,011
1995	1,909	3,002	534	907	6,353
1996	1,932	3,391	108	899	6,331
Total	8,006	14,336	1,601	4,138	28,080

Utilities in the Western States Coordinating Council (WSCC) predicted a tremendous increase in capital spending plans this year – $28 billion between 1992 and 1996, which is a 32-percent increase over last year's level. Generation spending climbed to $8 billion from $5.7 billion last year. WSCC utilities expect to spend $1.6 billion on load management and demand-side management over the next five years, which is more than is planned in all the other regions of the country combined.

POWER PRODUCTION UPDATE

HENRY STEIN, Senior Editor-Power Production

Document imaging reduces nuclear plant costs, efforts

WHITE PLAINS, NY—Hundreds of employees worked countless hours to prepare the documentation and testimony necessary to construct and operate nuclear Unit 1 of the Comanche Peak Steam Electric Station, as well as the documentation required to meet ongoing regulatory legislation.

"To handle this 'sea of paper' and to support construction of Unit 2," said Randall O. Taylor, program manager for the Texas Utilities Integrated Retrieval Project, "we explored image processing as a cost-effective means to consolidate activities and resolve duplicate manpower efforts."

Many benefits

Results? Retrieval time for document access has been reduced to one minute from the previous of up to three hours. Other benefits from image processing at the TU Electric station include: the ability to route, view and print document requests to any workstation; a reduction in labor requirements for document filing, retrieval and distribution; a reduction in storage costs; and better control of engineering drawing revision levels.

The company also expects a significant usage reduction in their more than 200 copying machines used to produce and distribute the duplicate documents. The imaging system provides multiple users access to the same documents.

About Comanche

Comanche's 1150-MW Unit 1 was placed in commercial operation on Aug. 13, 1990. The 1150-MW Unit 2, which is approximately 90-percent complete, is scheduled to be operational in 1993.

For Unit 1 alone, TU Electric introduced and acquired more than 50-million pieces of paper that were "active documents"--users needed continuing access to them. The information was stored in four areas onsite that took up more than 8.5 miles of shelving.

Each time a document request was received, the pages were reproduced and distributed, to the tune of hundreds of thousands of pages each month. This was a tremendous drain on finances and manpower.

How new system works

Comanche Peak Administrative Services and IBM made a joint development study to define the requirements for the plant's imaging system. When approved by utility management, a project team was created to implement a technical document system to help manage the paperwork associated with building and operating the nuclear facility.

The document management system is based on the IBM ImagePlus Multiple Virtual Storage/Enterprise Systems Architecture Object Management Program, IBM magnetic and optical storage devices, and about 130 IBM Personal System/2 image workstations for plant personnel. It handles a range of plant operating documents that vary in size from 8½ X 11 in. to large-size formats. The documents include quality assurance records, engineering drawings, in-process document level revisions and correspondence.

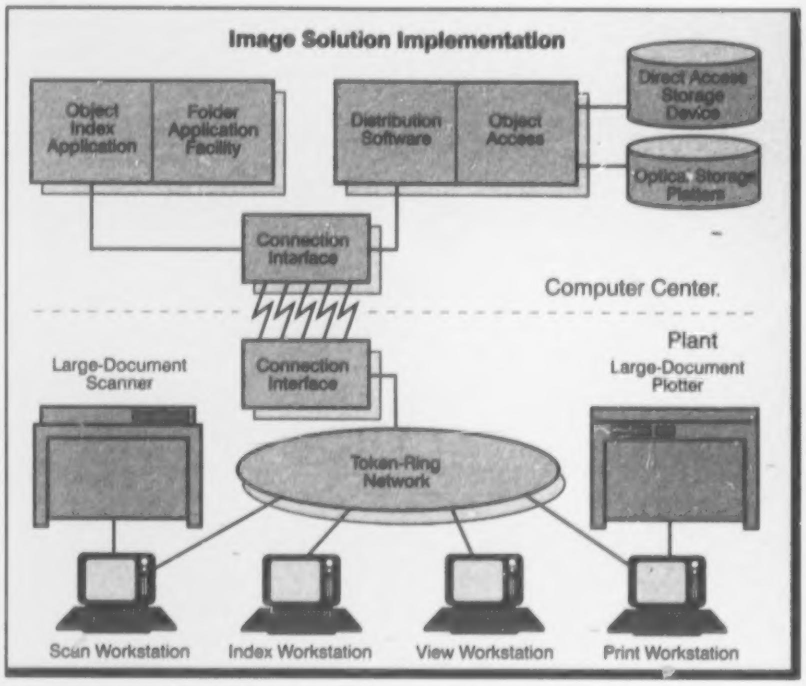
Scanning, viewing, and plotting are done by Scan-Graphics Inc.'s Friends-Plus application package which runs on the PS/2s using OS/2 Extended Edition software.

Although the Nuclear Regulatory Commission Generic Letter 88-18, as endorsed by Authorized Nuclear Inspector Bulletin 90-3A, allows for use of optical image storage instead of paper records, the utility has not yet destroyed its existing paper records. One reason for this is that the utility's insurance company has so far advised against taking the step. But almost all newly generated information is being stored only as topical images. The exceptions are 1800 vital station drawings for each unit.

Station personnel have already scanned more than 10,500 documents representing approximately 57,000 pages into the system. The process continues.

Previously, a drawing was made, microfilmed, and archived. Then about 100 copies of its aperture cards were made and distributed. Now, a drawing is scanned and digitized into the system. It is instantly available on all the plant terminals. It also is available at the corporate mainframe in Mesquite, TX.

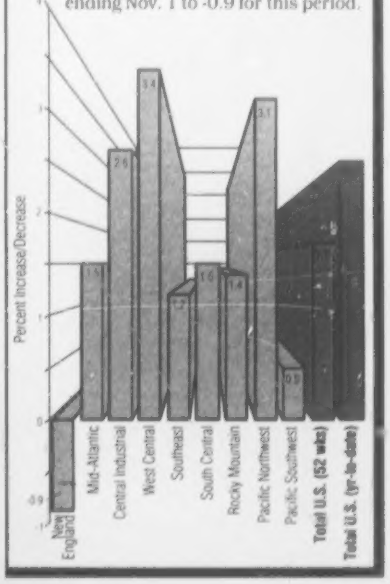
TU considers this a prototype system. The utility may install similar systems at its other plants.



ELECTRIC OUTPUT

Growth Slowed More

The increase in net electric output from the Mainland U.S. electric utility industry picked up slightly for the 52 weeks ending Nov. 23, as reported by Edison Electric Institute. New England's rate continued to fall from -0.7 percent for the 52 weeks ending Nov. 1 to -0.9 for this period.



New World Fuel Cell Council formed

LONDON—The formation of the World Fuel Cell Council was announced here on Nov.4. It is made up of fuel cell system producers and materials suppliers from the U.S., Japan, and Europe. The council will promote commercialization of fuel cells with a marketing and lobbying campaign.

Low emissions

Said Marcus Nurdin, managing director of the council, "The fuel cell is one of the critical technologies which could meet the world's expanding energy needs without harming the environmental integrity of the planet."

Nurdin added that the cells produce less CO_2 than conventional electric gen-

Continued on page 27

NEES commits to cut its air emissions 45% by 2000

WESTBOROUGH, MA—In one of the industry's most sweeping commitments to improve the environment, NEESPLAN 3, the New England Electric System (NEES) companies plan to reduce net air emissions from their operations by an estimated 45 percent by the year 2000.

The companies also are initiating cost-effective strategies to mitigate the effect of so-called Greenhouse Gases by following the recommendations of the National Academy of Sciences.

"NEESPLAN 3 sets three major goals for our system during the 1990s," said President and CEO John W. Rowe. "First, to achieve continuous, measurable reduction of all our environmental impacts, beginning with a 45-percent reduction in our net air emissions.

"Second, to restore stability to our rates by keeping overall rate increases at or below inflation for the balance of the decade...to demonstrate that environmental improvement is possible at affordable cost.

"And finally, to strengthen the diversity of our...resource mix by bringing additional nonutility generation into service, continuing our commitment to conservation and load management, and using natural gas as a generating fuel."

NEES plans to achieve the 45-percent reduction in air emissions through strategies such as:

- Complying with federal and state clean air legislation—11 percent.
- Using nonutility generation predominantly fired by natural gas—10 percent (900 MW by 2000).
- Repowering the oil-fired Manchester Street Station in Providence, RI, into a combined-cycle, natural-gas-fired plant—9 percent.
- Other new power sources entering service between 1990 and 2000, including purchasing electricity from Hydro-Quebec—6 percent.
- Continued conservation and load management efforts—4 percent.
- Methods of offsetting Greenhouse Gas production—5 percent.

Initial targets to reduce primary air emissions include:

- A 53-percent reduction in tonnage of SO_2 emitted, representing a reduction of 74,000 tons/yr between 1990 and 2000.
- A 50-percent reduction in tonnage of NOx emitted, representing 30,000 tons/yr in the same time period.
- A 20-percent reduction in emissions of CO_2 and other Greenhouse Gases, including CO, CH_4, N_2O, and chlorofluorocarbons (CFCs), representing the equivalent of 3-million tons of CO_2.

As for offset strategies, New England Power Co., the generation and transmission subsidiary, plans to solicit proposals for testing public acceptance, and technical and commercial feasibility of such efforts as tree planting, CFC recycling from refrigerators and air conditioners, methane recovery at coal mines, using coal ash in concrete, and enhancing marine algae growth to absorb CO_2.

In addition, NEES intends to initiate pilot projects in such renewable technologies as generation from biomass, waste-to-energy, landfill gas, wind, and solar.

NEES also formed an Environmental Collaborative to assist in developing and implementing the new strategies. The collaborative will include representatives from the NEES companies, the Conservation Law Foundation (a Boston-based environmental group), the New England Council, Massachusetts Institute of Technology, customer advisory councils, and the National Consumer Law Center.

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ELECTRIC LIGHT & POWER

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VOICE OF THE ELECTRIC UTILITY INDUSTRY

El Paso utility files Chap.11, 2nd utility since Depression

EL PASO, TX—El Paso Electric Co. (EPE) will reorganize under Chapter 11 bankruptcy protection, only the second major utility since the Depression to do so. Both utilities fell under the weight of nuclear-plant construction programs.

Public Service Co. of New Hampshire, which filed in 1988, still hasn't completed all transactions linked to its reorganization. (See story, this issue.)

"Our goal," said EPE Chairman David H. Wiggs Jr. in a statement, "is to emerge from bankruptcy as quickly as possible with a new rate and capital structure that will enable the company to offer competitive rates to our customers and earn a fair utility return for our investors."

Another EPE company spokesperson said, "I believe we exercised all available avenues."

How a filing works

Chapter 11 allows a company to develop a plan voluntarily to put its finances in order without lawsuits from creditors. Under Chapter 11, a federal court approves management actions and a majority of creditors must agree to the reorganization. All debts are not always paid. A plan is due in 120 days, but extensions will probably be sought, given the complexity of finances.

The reorganization is not expected to affect service to 248,000 customers in the city and the Rio Grande Valley of West Texas and southern New Mexico.

The Jan. 8 filing, foretold as a possibility by company executives, followed several months of negotiations with creditors and regulators. The Texas Public Utility Commission refused to change parts of a previous ruling on EPE's cost recovery from the Palo Verde nuclear project that might have helped the utility avoid the filing. Regulators did make a change the day of the filing, EPE said, that saves potential write-offs of $50 million.

Reasons for the fall

The reason for EPE's fall was largely expenses linked to its 15.8-percent share of the three units of the 3810-MW Palo Verde nuclear project. Financial developments include the following:

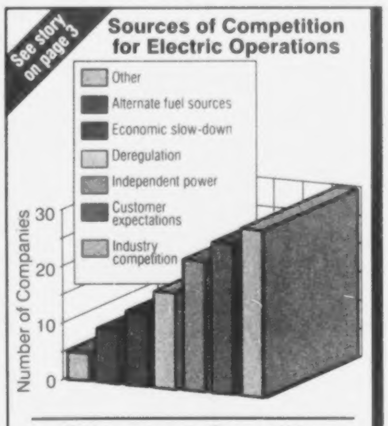
- In November 1991, state regulators granted a $52.8-million increase, but only $35 million was available immediately. On unit 3, $32 million was disallowed. EPE said it needed at least $84 million out of $131.3 million sought for Palo Verde expenses.

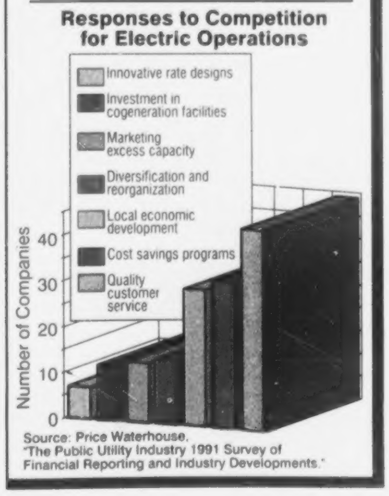
Regulators couldn't justify additional immediate hikes to help the utility pay its obligations, giving the utility a five-year phase-in plan to recover other costs. This was the fourth base-rate increase linked to Palo Verde, state regulators said in a release.

After the filing, the state commission took steps to try to retain jurisdiction over rates during reorganization, but said it would cooperate with the federal bankruptcy court.

- EPE has $1.084 billion in debt. Including sale and leaseback payments, the amount is closer to $2 billion, according to the company. EPE had previously received several extensions on payments to try to settle its finances in negotiations since November of last year. About $400 million was due at year end.
- A $20-million payment for Palo Verde electricity was due Jan. 9, the day after the filing. The utility couldn't come up with money.
- Through nine months of 1991, EPE showed a loss of $26.7 million, 75 cents per share, on revenue of $329.3 million.
- On Jan. 6, El Paso's city council said it would try to reclaim $1.6 million from EPE, citing excessive rate increases.
- Credit ratings by Moody's Investor Service fell on $800 million of EPE securities after the filing.

See story on page 3


Sources of Competition for Electric Operations


Responses to Competition for Electric Operations

Source: Price Waterhouse, "The Public Utility Industry 1991 Survey of Financial Reporting and Industry Developments."

End CMS Energy's PUHCA exemption, Michigan tells SEC

DEARBORN, MI—The Michigan attorney general asked federal regulators to revoke CMS Energy's exemption to the Public Utility Holding Company Act of 1935 (PUHCA). CMS Energy denied all related claims.

"The Michigan Public Service Commission has found Holding Company Act abuses by CMS Energy and [subsidiary] Consumer Power Company," charged Michigan Attorney General Frank Kelley in a statement, including:

- "Misuse of ratepayer funds to benefit utility affiliates.

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LATE NEWS

Nova Scotia intends to sell 57 percent of its Nova Scotia Power Corp., in public shares, for $400-million Canadian dollars (U.S. $348 M), to reduce debt. The province told of plans to privatize the entire utility within five years.

Detroit Edison and **Southern California Edison** each will expand previous electric-vehicle infrastructure research in a 30-month deal to lease a fleet of 10 Ford Ecostar electric vans, starting in 1993. Eighty vans will be leased for research, said Ford, which expects sales by 1998.

Sacramento Municipal Utility District plans to develop cogeneration, Pacific Northwest options, advanced technology, renewable resources and demand-side management, and not repower the closed Rancho Seco nuclear plant with natural gas.

SO_2 allowance report: p.13

PG&E Energy Center helps teach efficiency

Visitors to Pacific Gas & Electric's new Pacific Energy Center learn that energy efficiency isn't always high technology. This display shows customers that wise landscaping can help lower air conditioning bills. **See story, p.2.**

Arc darkens Washington after 'unlikely sequence'

WASHINGTON—An arc in a substation tripped two 230-kV lines and eventually a power plant, causing a 2.5-hour outage in parts of downtown Washington, DC, on Jan. 6, said Potomac Electric Power Co. (PEPCo). Later plant start-up damaged a generating unit.

"We can supply power to all customers without the plant, or without one or both 230-kV lines, but when all three went down, we lost [the ability to supply] power," according to PEPCo spokesperson Steve Arabia.

It was a "very unlikely sequence of events," he said, adding that the company never had such a big outage in downtown—18,000 customers.

Something happened after switching

When the utility activated remote switching at a southeast Washington substation, "something happened" to cause the arc between a reactor on one 230-kV transmission line and an adjacent 230-kV line 13-ft away. A reactor controls voltage.

The system imbalance from both lines going out tripped the 480-MW, coal-fired Potomac River plant. There was also a small fire in a downtown underground vault, Arabia said. An investigation continues.

The incident started at 5:05 p.m. Power was restored starting at 7 p.m., when one of the 230-kV lines was brought up. Three of the Potomac River units were started by 9 p.m., but during startup of the fourth, about 4:30 the next morning, there was an explosion in the boiler. Damages were isolated at the 102-MW unit and no injuries occurred at that Alexandria, VA, plant, Arabia said. This caused no additional power outages.

Large customers lose power

Customers without power included the State Department, the Federal Reserve, several subway stations, and PEPCo headquarters. Power was also cut off to the White House, but emergency generators there almost immediately resupplied power. Inoperative traffic signals snarled traffic.

PEPCo serves Washington and some suburbs in Maryland.

Nuclear unit relicensing rule mandates hearing on wear, no new-plant upgrades

Mark T. Hoske, News Editor
Henry Stein, Power Production Editor

WASHINGTON—The new U.S. nuclear plant relicensing rule allows up to a 20-year license renewal for operating nuclear power plants. The NRC adopted the rule in mid-November, 1991, to give plants a chance to operate beyond their initial 40-year licenses.

The final Nuclear Regulatory Commission (NRC) rule requires a formal NRC review and public hearing on age-related wear, but avoids retrofit upgrades to new-plant standards.

Holding owners to the full standards required for newer plants might have been too costly for many plants to continue operation. Because plants are upgraded during their operating lives, it was unnecessary to include upgrades in the renewal application, said NRC.

The new rule, which took effect Jan. 13, will not require review of all details that form the basis for the present license. Such a review might have tied up the process, observers noted.

Altogether, "The new rule seems to be quite reasonable," said Ron Simard, of the Nuclear Management and Resource Council, a group that represents nuclear utility interests in Washington.

In addition, the hearing on age-related wear will be limited in focus and shouldn't be an opportunity for anti-nuclear activists to unfairly delay the process, Simard suggested.

Licenses of 47 nuclear plants are scheduled to expire in the years 2000 to 2014. The Department of Energy (DOE) has said that renewing the licenses of two-thirds of the 111 U.S. nuclear units will save $60-300 billion in construction costs required if the plants were replaced. Forty-eight entities hold licenses to operate U.S. nuclear plants.

Safety first

The new NRC regulation sets standards utilities have to meet when applying for the new license. NRC Chairman Ivan Selin noted the rule "requires... utilities to perform technical analyses to demonstrate that their licenses can be safely renewed."

The new rule:

- Addresses any additional safety-related concerns not covered in ongoing regulatory oversight.
- Adds, to the existing license, new commitments to monitor, manage, and correct age-related wear.
- Requires an application be submitted to the NRC 5-20 years prior to license expiration.

The DOE expected the first license renewal application to be submitted by Northern States Power Co. for its Monticello nuclear plant located near St. Cloud, MN, in January. The application is jointly supported by DOE and the nuclear industry, according to DOE.

Yankee Rowe was to have been the first to file for relicensing (in 1990), but questions about the strength of its reactor vessel caused Yankee Atomic Electric Co., the owner-operator, to postpone the filing (*EL&P*, 11/91, p.3).

Declared DOE Secretary James D. Watkins, "Nuclear plants can continue to operate safely beyond the 40-year license term, and DOE's program with the NRC is designed to prove and assure that."

Proposed training rule praises current system

WASHINGTON—The Nuclear Regulatory Commission's proposed rule on training recognizes the effectiveness of training programs now in place, rather than imposing prescriptive procedures.

The proposal, released Jan. 7, endorses and requires the systems approach to training used by the nuclear industry over the past 10 years and the military for the past 20, explained Ron Simard, director of industry relations for the Nuclear Management and Resources Council.

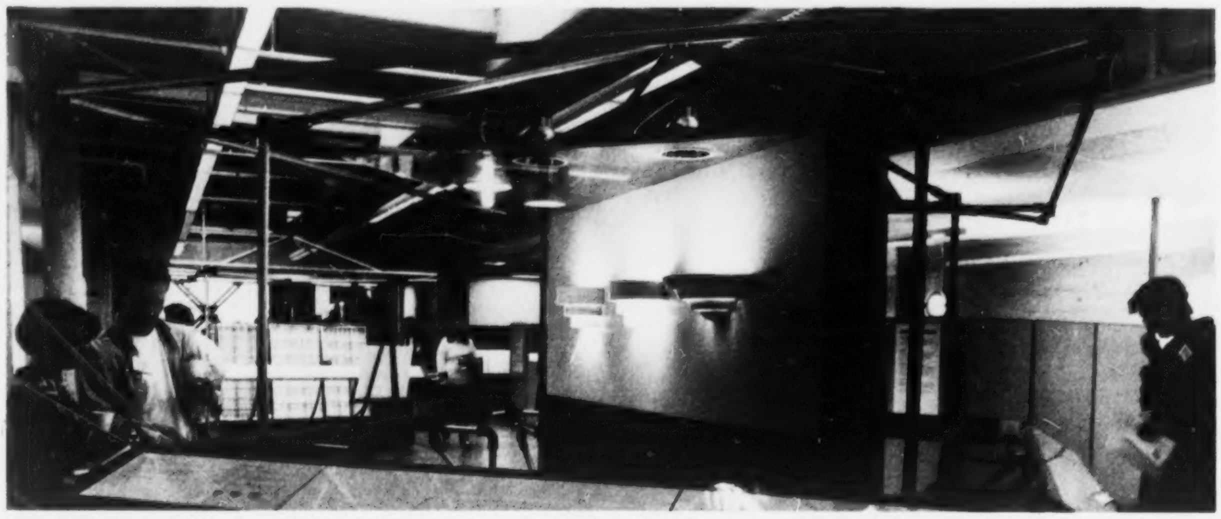
Builds on initiatives

In a statement, the NRC said, "the proposed rule would build upon current industry initiatives related to training and qualification."

In part, it would require analysis of job requirements, identification of learning objectives, and evaluation of employees and the training program. Programs would have to be in place 180 days after the final rule, according to the NRC.

Comments to the NRC on the proposed rule are due by March 9.

PG&E's Pacific Energy Center guides efficiency efforts



PG&E customers examine energy efficient lighting options on display at the Pacific Energy Center's lighting lab. Skylights offer "free" natural lighting

SAN FRANCISCO—PG&E's Pacific Energy Center, located downtown, provided significant power over the past two months, without any SO_2 or NOx emissions, without nuclear fuel and without hydro resources.

The $7.5-million, demand-side management "power plant" teaches customers how to use energy wisely. It's part of Pacific Gas & Electric Co.'s 10-year, $2-billion customer energy efficiency program aimed at reducing growth in electric demand by 75 percent or 2500 MW.

Although the company's 1991 efficiency efforts saved enough electricity to power 66,000 homes and natural gas to supply 49,000 homes. "This center is certain to help achieve greater savings for years to come," said Richard A. Clarke, PG&E chairman and chief executive officer.

During the first month since the center's Dec. 5 opening (*EL&P*, 1/92, p.1), more than 3000 people stopped in to learn from state-of-the-art energy equipment, appliances and designs.

Paul Ward, PG&E spokesperson, said more than 1000 people visited the center in the first two days of operation. PG&E has 16 energy experts there to help architects, engineers, builders, designers, developers, and others plan for the use of energy-efficient technologies in homes, commercial buildings and factories.

Clarke said, "The success of this center will be measured by the energy our customers save and the lower energy costs that result. Its success will also be measured by the amount of pollution prevented as a result of reduced energy use." In addition, California regulators now allow utilities to benefit financially from efficiency efforts, such as including the cost of the center and its operation through 1993 in rates.

The 25,000 ft^2 center includes:

- Challenge 200 House and Power Play, which are hands-on experiments with new lighting, water heating, washing, drying, cooking and insulating technologies and an interactive computer to answer customer energy-use questions.
- A lighting lab to help professional designers work with and learn more than 100 technologies in efficient lighting.
- Professional design laboratories allow demonstration experiments and construction of design models to implement super-efficient indoor and outdoor lighting, heating, air conditioning, residential and commercial energy systems and efficient use of natural lighting and heating.
- Classrooms, an ergonomics and video display terminal demonstration and resource center for worldwide computer access to information.

The center is open 38 hours a week, Tuesday through Saturday, including Thursday until 8 p.m.

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Did you hear....

"When the Senate voted...not to debate S.1220, the comprehensive national energy strategy bill before it, the lessons offered from the conflict in the Persian Gulf were ignored. Control of energy resources equates to power—military power AND economic power—and to ensure a stable economy and the nation's security, the United States must reduce its dependence on energy sources outside of its own control.

"This simple scenario is why AGA is urging Congress to resume consideration of a national energy policy bill...."

—Michael Baly III
President
American Gas Association

Illinois Power: competitive markets

Utility computer-aided economic development increases load

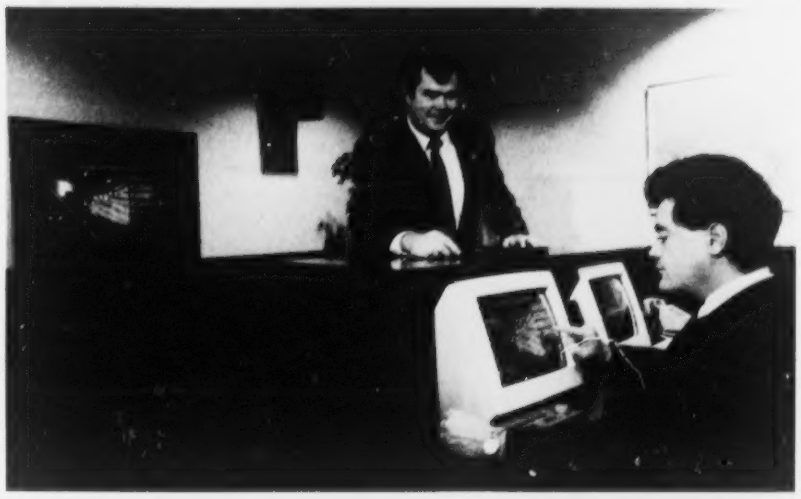
DECATUR, IL—Illinois Power Co. runs the most aggressive economic development program in the state, according to the utility. During 1991, eight companies recruited by Illinois Power have announced plans to invest more than $87.3 million in downstate locations.

Like other utilities, Illinois Power (IP) uses economic development to attract new business, expand current businesses and increase electrical load.

IP, an investor-owned electric and gas utility, serves one-quarter of Illinois and has about 561,000 electric customers. About half of electric revenue is industrial. The utility expects its economic development program to contribute to a predicted 3-percent annual growth in weather-normalized kilowatthour sales during 1991-1995.

The utility's economic development program has 19 full-time professionals focusing on attracting domestic and international business investments to northern, central and southwestern Illinois. This team uses IP's newly developed Center for Site Selection's advanced electronic technology to provide free customized presentations and other services to prospects, real estate agents and consultants.

> **"Cutting-edge laser and computer technology allow clients to touch a video screen and be transported to communities throughout Illinois."**
>
> ***—Robert Treat, Illinois Power Co.***



Illinois Power's interactive video computer system helps businesses quickly choose a site to fit its specifications. Such systems, and related programs, increase utility competition for load growth

"Realtors can call with a prospect's site requirements and within five minutes have a sheet listing available locations meeting those requirements sent via facsimile," said IP's public information contact, Frank Beaman.

Robert Treat, supervisor of business development, explained further: "Within 24 hours, the Center for Site Selection can have videos of the site, buildings and community in their mailbox. Cutting-edge laser and computer technology allow clients to touch a video screen and be transported to communities throughout Illinois."

Treat explained that hundreds of buildings and sites—listed by industrial and commercial real estate agents across the state—can be toured during a few hours in the center's Decatur offices.

IP's system, shown at several industry meetings, touts an advanced electronic system that simulates a building's specifications, places it in the prospective location, landscapes it, paints a company name on the sign and prints a color image for the client to take immediately.

Video overviews of each community include:

- Summaries of wages
- Tax rates
- Labor skills
- Environmental considerations
- Utility access
- Government incentives
- Transportation availability
- Land costs

IP offers the information in five languages—German, English, Japanese, Korean and French.

George Levi, IP's director of economic development, said the center's portable interactive video system runs about $25,000. He said a number of other utilities have similar systems including Georgia Power Co., Alabama Power Co. and Oklahoma Power & Light.

Levi offers a satisfaction guarantee to prosective new customers: "If we don't have a location that works for you, we'll tell you which of our competitors might."

In 1991, the Center for Site Selection had more than 700 visitors. Customized videotapes, assembled and edited at the center, have been sent out in response to more than 100 individual requests, Levi said.

Economic development efforts go beyond high-tech equipment. The utility has interconnected networks with city, regional and state economic development agencies and services, Treat explained. Quarterly breakfasts in Chicago and St. Louis sponsored by IP allow industrial realtors to share information and develop relationships, he added.

The IP staff regularly attends regional and national meetings of the National Association of Corporate Real Estate Executives and of the Industrial Development Research Council.

Also, IP actively recruits businesses using direct mail, advertisements, trade shows and a targeted call program, Treat said. Much of the information and the techniques for gathering it are shared with newcomers to the economic development business.

People at IP noted that prompt follow-up is integral to the program's success. Every person who shows interest receives a letter or phone call within 48 hours.

Illinois Power also markets to the international banks, trading companies and businesses and seeks direct investments. Dossiers on about 30 customers interested in joint ventures, export opportunities, and sales or licensing agreements are presented at trade shows and during overseas investment trips.

Convenient location is among IP's selling points, Treat points out, because Decatur is located 179 miles from Chicago, 153 from Indianapolis, and 130 from St. Louis.

Competition, environment, flexibility are top concerns

CLEVELAND—Proactive competitive moves, flexibility in power purchases and more careful treatment of the environment are three top utility challenges, according to Price Waterhouse's "The Public Utility Industry, 1991 Survey of Financial Reporting and Industry Developments."

Other majors issues listed were industry consolidation, diversification, comparable access and new gas industry markets, least-cost planning, open access power transmission, rate-case issues, and accounting developments.

Environmental matters, as a whole, have been a growing concern, noted Paul R. Bjorn, chairman of the Price Waterhouse Public Utilities Industry Services Group.

"Of the 100 companies we surveyed, 96 addressed environmental matters such as clean air, ground and water contamination, safe drinking water, waste disposal and research and remediation," Bjorn said.

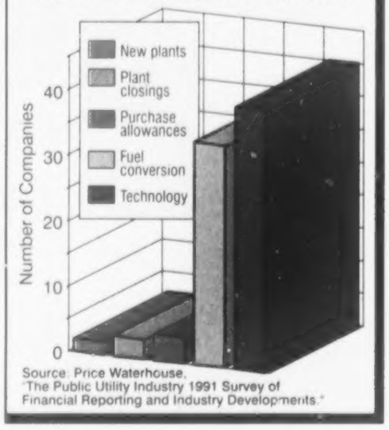
The 110-page report, released in December 1991, includes some 1991 figures. It was based largely on assessment of 1990 annual reports: 70 electric and combination utilities, 25 gas and five water companies.

Competition

In the report, utilities said it is becoming increasingly difficult to be the supplier of choice. Traditional investor-owned electric utilities are being challenged by:

- IPPs [independent power producers] and cogenerators for energy sales to large industrial and commercial customers.
- Municipalities and cooperatives in areas where customers are allowed to choose their energy provider.
- Other utilities for bulk power sales.
- Other regions of the nation for economic development.

Potential Methods of Compliance with Clean Air Act Amendments



Source: Price Waterhouse, "The Public Utility Industry 1991 Survey of Financial Reporting and Industry Developments."

Sources of, and responses to, utility industry competition are shown, on page one in this issue of *EL&P*. "The underlying strategy most often noted in addressing competition was to make the customer the company's number one priority," said the report.

The major factors driving utilities toward conservation and demand-side management programs were listed as escalating costs and growth in demand. Regulatory concerns ranked the lowest among listed drivers.

Technology and fuel conversion were the two most common compliance methods for abiding by the Clean Air Act Amendments of 1990, while purchase of allowances, plant closing and new plants were way down the scale. (See graphics, this page.)

Resource planning

Solutions to resource planning, in descending order, were:

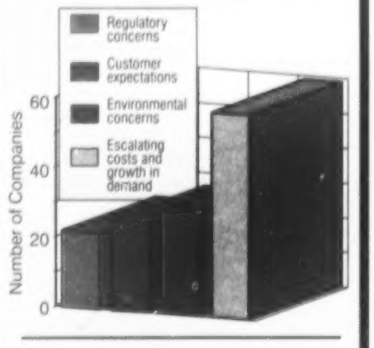
- Load and demand-side management;
- Inter-regional bulk power sales, purchases of other power;
- Combustion-turbine generators;
- Non-utility construction of cogeneration facilities;
- Repowering existing units, life extensions;
- Fuel diversification;
- Competitive bidding;
- Long-term, flexible power contracts.

Reports of sale and leaseback transactions doubled to 16 in a year.

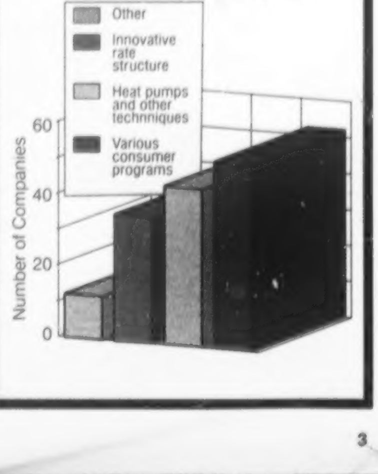
Diversification activities

Among the 70 electric and combination utilities, more than 50 were involved in energy-related diversification in 1990, more than 40 were involved in "services," and more than 30 were involved in real estate. Among energy related activities, cogeneration topped the list, more than 35 companies; in descending order were exploration and production, transmission and storage, coal mining, and gas brokering.

Factors Leading to Use of Conservation and Demand-Side Management Programs



Commonly Utilized Conservation and Demand-Side Management Techniques



SO_2 emission allowances become the new paradigm in utility planning

TAMPA, FL – Even though sulfur-dioxide emission allowances will fundamentally change the way utilities do business in the 1990s and beyond, there's still only a dim understanding of how the market will work.

The allowance market, created by the Clean Air Act Amendments of 1990, is the newest and most innovative tool for utilities to cut in half and cap SO_2 emissions by the year 2000. Allowances – basically a federal license to emit a ton of SO_2 during a year – are required for many generating plants under the new guidelines. Others may volunteer to be included to gain credits.

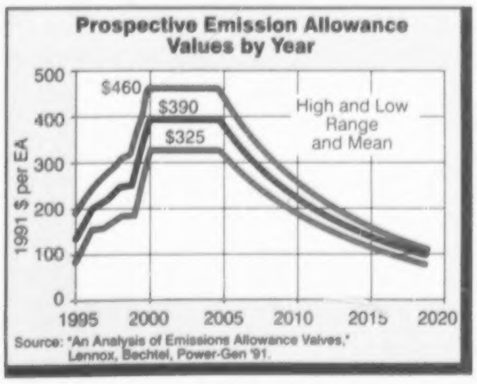
Several speakers at the recent Power-Gen Exhibition and Conference here offered some insights.

"There's a new paradigm in environmental control – the market approach compared to the old command-and-control approach," said Philip O'Connor, chairman of the Chicago consulting firm, Palmer Bellevue Corp., and head of the subcommittee that is advising the Environmental Protection Agency (EPA) on the establishment of an allowance trading and tracking system. Allowance trading is the key to the market approach.

Chicago Board of Trade hopes to offer SO_2 emissions allowances as a cash and futures commodity on its exchange, as previously reported. The New York Mercantile Exchange also wants to trade

"The difficulty," said O'Connor, "is that no one can really know now what allowances will be worth – yet compliance options are highly dependent on estimating what the value might be."

Acid-rain compliance plans must be filed by early 1993, but commitments have to be made before that to take advantage, for example, of the bonus allowances to be awarded to utilities who opt for scrubbers for plants burning high-sulfur coal.



Prospective Emission Allowance Values by Year

Source: "An Analysis of Emissions Allowance Valves," Lennox, Bechtel, Power-Gen '91.

Mark Garrison, United Engineers & Constructors, said the Phase 1, 1995 deadline affects 261 generating units. He estimated Phase 2, starting in the year 2000, likely will include 600-700 units, possibly as many as 1000 units (all units 25 MW and over). Some estimates say 1500, or more, units might be involved in Phase 2.

There is a total of 5.4-million SO_2 allowances available in Phase 1 and 8.9 million in Phase 2, primarily based on what units emitted during a 1985-87 baseline.

These allowances can be traded and sold through market mechanisms that have not been fully defined yet. Utilities can reduce emissions from affected units below the allowance level and sell excess allowances, or they can buy allowances and use them at affected units to emit above the allowed level.

The allowance 'crop'

Richard Sandor, a director on the Chicago Board of Trade, said the commodity and futures exchange plans to trade SO_2 allowances in 25-ton lots, approximately equal in value with 100 oz. of gold.

He noted that the value of the SO_2 "crop" is worth about 75 percent of the U.S. wheat crop, a good reason for commodity traders to get involved. Some estimates value the market at \$40-160 billion. Trading has value for utilities, Sandor said, since "speculators provide a buffer stock of the commodity in market cycles."

The cash, "spot and forward," market will be organized in the second half of 1992, and the "futures" market will start in 1993, said Sandor, who is also an executive managing director at Kidder, Peabody and Co.

"This is a great opportunity to take all our financial engineering and apply it to social problems," Sandor said, adding that the market will put a price on "environmental cleanup."

Allowances are still seeking a price, said Palmer Bellevue's O'Connor, adding that there have been no known commercial transactions so far. Offers to sell have been made, however, including Long Island Lighting Co., see sidebar.

First application

O'Connor calls allowance trading the first big application of least-cost planning or integrated resource planning in the utility industry that does not rely on government dictating costs. It's also the first time that "external" environmental costs have been directly "internalized," he added.

Mark Perlis, of the Washington, DC-based law firm of Dickstein, Shapiro & Morin, noted that the trading guidelines remain general as EPA seems to be "leaving it pretty much to the market."

Perlis reasoned that the risk-averse, regulated utility industry is "simply not rushing to place a value on allowances." With the prospect of a disallowance for a "wrong" move, "utilities are very skiddish on how compliance will be handled by electricity rate regulators.

Allowance value

Frank Lennox, manager of market analysis and strategic planning for Bechtel Power Corp., Gaithersburg, MD, estimated allowance values based on the cost of SO_2-emission control.

"How hard can it be to set an allowance price?" Lennox asked. "It has to be related to the cost of compliance."

Even though the market's quiet now, Lennox said he expects about 400,000 allowances to be sold in Phase 1. As many as 750,000 could be economically justified, he argued.

Lennox calculated the "book value" for allowances over time by analyzing the physical features and fuels burned in the major affected units (see graphic). The value will start out low, at \$80 to \$180 per ton (in 1991 dollars), then rise through the late 1990s.

Price is initially low, Lennox explained, because many affected units can meet the 1995 Phase 1 emission limit – 2.5 lb per million Btu – through low-cost emission-reduction steps such as switching to low-sulfur coal. Forty-five of the targeted units already comply with Phase 1, creating a potential pool of 280,000 allowances for sale.

Phase 2

"Phase 2," said Lennox, "is a different market." The tougher Phase 2 emission limit of 1.2 lb per million Btu will cause allowance values to climb after 1995 and reach a maximum value of from \$325 to \$460 by the year 2000. This is based, in part, on the increased need for scrubbers in Phase 2 at a capital cost of from \$140 per kW to \$260 per kW. Overscrubbing affected units creates most of the allowances for sale. At the peak of allowance trading in Phase 2, the "economically profitable" level will be from 2.6-million to 3-million allowance sales, said Lennox.

Allowances Offered at EPA Auctions and Sales

Year of Purchase	Spot Sale	Advance Sale[1]	Spot Auction	Advance Auction[1]
1993	--	25,000	[2]50,000	100,000
1994	--	25,000	[2]50,000	100,000
1995	--	25,000	50,000	100,000
1996	--	25,000	150,000	100,000
1997	--	25,000	150,000	100,000
1998	--	25,000	150,000	100,000
1999	--	25,000	150,000	100,000
2000 and after	25,000	25,000	100,000	100,000

[1] Not useable until 7 years after purchase.
[2] Not useable until 1995.

Source: EPA

Allowance value should begin to fall after the year 2005 as retirement of old, emitting units and replacement by new, clean units create unused allowances and a buyer's market.

Lennox's projections are significantly lower than the \$300-600 Phase 1 and \$400-1200 Phase 2 estimates recently cited by the Electric Power Research Institute.

Acknowledging the planning risks, Lennox said, "I wouldn't bet my son's college money on any allowance price projection."

Flexibility, uncertainty

The EPA's Rachel Hopp told Power-Gen, "We [at EPA] know how to do command-and-control. The new system is a completely different approach."

Hopp, the EPA section chief in charge of implementing many of the new requirements, noted that utilities must file their permit applications by Feb. 15, 1993. She warned, "Don't wait until February 15 to make your first contact with EPA." Hopp suggested that utilities file compliance plans that contain options to deal with uncertainty on issues such as allowance values.

"We're hell-bent on building flexibility into this program," said Hopp.

John Henry, president of Washington, DC-based Clean Air Capital Markets, noted that utilities started their compliance plans a year or more ago. The letter of intent for scrubber installation as a compliance option is due March 1, he said.

EL&P's Robert Smock and Mark T. Hoske contributed to this article.

LILCO continues talks about selling 50,000

HICKSVILLE, NY – "We have elected not to select any final proposals at this time," said Suzanne M. Halpin at Long Island Lighting Co. about the 50,000 SO_2 emissions allowances (1995-99) it put on the market spring 1991.

Halpin said LILCo was still "continuing discussions with bidders" at year-end. She declined to say if price was the reason for missing a previously named announcement deadline (*EL&P*, 9/91, p.3). Halpin also said LILCo declines to name any other date for a decision. More than 10 bidders were said to have expressed interest, but that could not be confirmed.

LILCO had sought bids to test the market for allowances. The utility has the credits because state regulators required a switch to lower-sulfur oil at two generating plants after the baseline measurement period of 1985-87.

Count allowances as inventory, FERC says

WASHINGTON – The Federal Energy Regulatory Commission proposed accounting rules for SO_2-allowance trading, suggesting that utilities count credits as inventory, rather than utility plant, fuel, or in other categories.

The Dec. 2, 1991, proposed changes would require new accounting forms and changes in FERC reporting forms to record acquisition, holding and disposition of allowances.

However, "The proposed rule is not intended to prescribe the ratemaking treatment for allowances," noted the FERC release.

POWER PRODUCTION UPDATE

HENRY STEIN, Senior Editor-Power Production

Largest CFB in world going up and keeping ahead of schedule

SAN DIEGO—Point Aconi Unit 1, at 165 MW, will be the largest circulating fluidized-bed boiler (CFBB) in the world when it is finished in the spring of 1993, according to Pyropower Corp., the CFB boiler supplier.

Adjacent to the Prince Coal Mine in the Cape Breton area, the CFBB will be operated by and for the Nova Scotia Power Corp. (NSPC).

More than half done

Construction passed the 50-percent mark at the end of November 1991, with the combustion chamber and boiler backpass pressure components erected in December and final welding about 75-percent complete.

Boiler hydrostatic testing was a month ahead of schedule in December and was projected to be complete by March of this year. Boiler refractory and insulation work was to begin in the first quarter of '92, with plant commissioning to start in the fall.

Why CFBB?

NSPC chose the CFBB after a 10-year study of boiler alternatives. CFB technology was picked for its inherently low emissions of nitrogen oxides, in-situ control of sulfur dioxide emissions using limestone, and fuel flexibility, including the ability to burn relatively high-ash coal without slagging. Guaranteed SO_2 removal is 90 percent, and guaranteed NOx emission is 0.4 lb/MMBtu or less.

Prime contractor is Mitsui & Co. Ltd., while Sargent & Lundy Engineers is acting as project manager and architect/engineer.

Construction site of the Point Aconi circulating fluidized-bed boiler power plant shows coal processing building going up at left of photograph, stack in center, and boiler building on right. The 165-MW plant is scheduled to go online in the spring of '93.

Is Yucca Mt. site safe? Two views

LAS VEGAS—Storing high-level nuclear waste at Yucca Mountain, NV, still is a subject of controversy and extreme differences in opinion. In mid-December, a panel of five geologists split 3-to-2 on whether an earthquake might drive water from under the proposed repository up into it, causing the hot containment canisters to crack and leak radionuclides into the atmosphere.

The reports of the majority and minority panelists' opinions were released in mid-month by the Dept. of Energy.

In addition, a panel of the National Academy of Sciences is preparing its own report on possible flooding of the site. This report is scheduled to be ready early this year.

About the controversy

The panel of experts, who were not part of DOE, was formed by DOE to evaluate reports and proposals put forth by J. Szymanski, a geologist with DOE. He originally proposed the flooding theory.

The three panel members' 87-page majority report discounted Szymanski's ideas by saying he had not developed "an adequate theoretical basis for the mechanisms and consequences nor a body of evidence that is sufficiently supportive to require further investigation...." They further noted, "The concept of sudden large wall rock separations on faults [to allow the water to well up]...has not been established, and it is not supported by experience or other evidence."

Minority rebuttal

The two-member minority, on the other hand, stated in a 162-page rebuttal, "Nevertheless, since the individual mechanisms and physical processes evoked in Szymanski's integrated conceptual model...are all recognized to be possible physical phenomena and could be important (produce large effects) in some circumstances, it is clearly necessary to consider whether they are applicable...." They went on, "...the general processes...can conceivably occur."

Both sides called for onsite studies to try to resolve the questions brought up.

The majority members of the panel were Dr. Dennis W. Powers, geologist at the University of Texas, Dr. John W. Rudnick, rock mechanics expert at Northwestern University; and Dr. J. Leslie Smith, hydrologist at the University of British Columbia. Minority members were: Dr. Charles B. Archambeau, geophysicist at the University of Colorado, and Dr. Neville J. Price, geologist at University College, London.

in New Mexico

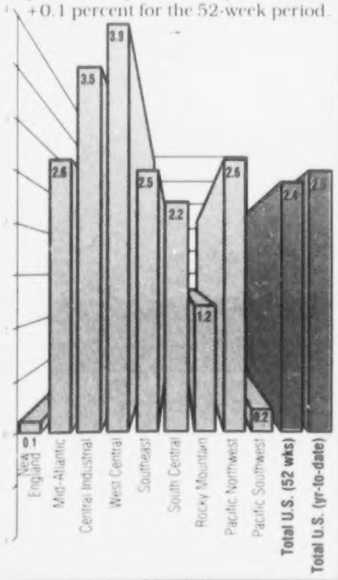
In a related development in late November, a federal district judge issued an injunction indefinitely barring opening of the Waste Isolation Pilot Plant in Carlsbad, NM. The decision on the plant, which is to be a permanent repository for nuclear wastes, was on a lawsuit by New Mexico, Texas, and four environmental groups against Energy Secretary James A. Watkins.

The suit said Watkins violated federal law by trying to open the pilot plant without congressional approval. Judge John G. Penn declared in his decision that the suit had a strong likelihood of success and so he prohibited DOE from placing any waste in the plant until the litigation was settled.

ELECTRIC OUTPUT

Growth Slowed More

Net electric output from the Mainland U.S. electric utility industry continued increasing at a slow rate for the 52 weeks ending Dec. 21, as reported by Edison Electric Institute. New England's rate finally moved up into the plus side of +0.1 percent for the 52-week period.



Combustion turbine runs on coal

WASHINGTON—The Department of Energy announced that, for the first time, a combustion turbine ran with direct coal firing on Oct. 30. The Allison Gas Turbine Div. of General Motors Corp. tested a 4-MW gas turbine fueled by a mixture of finely ground coal and water.

This was the first test in which a modern gas turbine ran long enough without damage to verify that coal firing could become an option for producing power.

Past attempts failed when tiny ash particles from the burning coal eroded/turbine blades or plugged gas flow passages. The problem was so bad that some tests had to be stopped after only 15 min of run time. The Allison tests lasted for 4 hr, the planned duration, with no apparent ill effects on the gas turbine.

The test took place at the company's Indianapolis plant in August, but DOE held up making the announcement until it had completed its review of the test data. The data showed that complete and stable combustion occurred and the turbine performed as designed.

Not only did the test prove that gas turbines could be fueled by using the nation's abundant coal supplies, but also that the turbines produced less smog-forming NOx than current gas- and oil-fired units.

The Allison turbine used a new combustion system named the "rich, quench, lean," or RQL. The system is a a three-stage, high-pressure combustion process in which coal first burns at temperatures around 3000°F (1820°C) in a fuel-rich zone with a limited amount of air. The partial burning of coal does not allow enough time or oxygen for the nitrogen to combine with the air to form large quantities of NOx.

The fuel-rich gases then are doused with water in a quench zone, which "freezes" the low NOx content. Quenching lowers the temperature and solidifies coal ash so it can be removed before harming the turbine. Combustion is completed in a third, fuel-lean zone.

In the tests, the system limited NOx emissions to 25 ppm. When used with gas-fired units, it is estimated that RQL technology will burn with even lower NOx emission levels.

The fuel for the tests was subbituminous, low-sulfur coal. In the remaining three years of the DOE contract, Allison will focus on developing a dry, pulverized-coal feed system to replace the slurry-fuel system. The switch should lower costs. Other work will include tests of advanced techniques for removing sulfur pollutants and small flyash particles.

The company has begun to offer RQL-equipped combustion turbines for natural-gas-fired systems in California where NOx emission limits are among the most stringent in the nation. A coal-fueled version is expected to be ready for commercial sale in the late '90s.

DOE awards second and third MRS grants

WASHINGTON—The U.S. Department of Energy awarded two grants for almost $100,000 each to study the feasibility of siting an above-ground, Monitored Retrievable Storage (MRS) facility for temporary storage of commercial nuclear spent fuel. In late November, DOE awarded one to Grant County, ND, and another to the Chicksaw Indian Nation of Oklahoma on Dec. 30.

The money will be used by both parties to look at the nuclear waste management system and determine if they are interested in pursuing further feasibility studies for the MRS.

These were the second and third such grants for feasibility studies. The first, in mid-October, went to the Mescalero Apache Tribe of New Mexico. In commenting on this first award, John Bartlett, director of the Office of Civilian Radioactive Waste Management, said, "This award is an important first step forward for the program."

The MRS facility will receive, temporarily store, and stage spent nuclear fuel slated for ultimate disposal in a permanent geological repository.

The applications are only considered "expressions of interest" by DOE. None are construed as a commitment on the part of the applicants to actually host the facility.

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ELECTRIC LIGHT & POWER

EL&P

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VOICE OF THE ELECTRIC UTILITY INDUSTRY

LATE NEWS

Senate may pass a revised omnibus energy bill by March. Debate and a flurry of amendments, halted by a recess, were expected to continue after Feb. 17.

Clean Air Act Amendments of 1990 may generate $50 billion in revenue related to pollution control and fuels, says an Environmental Protection Agency report.

Global carbon-dioxide emissions trading is the best way to solve climate-change concerns, says a United Nations study. It also recommends forming the global equivalent of the EPA.

Bush budget adds utility fees, increases key energy spending

Is new charge fair for DOE nuclear cleanup?

WASHINGTON—Highlights of President Bush's fiscal-year 1993 budget proposal include:

- Certain tax and accounting incentives, including cuts in capital gains rates.
- A 0.33-mil/kWh fee on nuclear generation as of October 1992 to pay for cleanup at three federal nuclear fuel enrichment plants.
- Increased funding and staff for implementing the Clean Air Act Amendments of 1990.
- A 24-percent increase for research on global climate change.
- Increases for the Department of Energy, including conservation, solar and renewable technologies, and environmental research.

The president's State of the Union Address also revealed a plan to place a 90-day moratorium on regulation seen as hindering business growth. As a result, the Environmental Protection Agency may be required to delay some clean-air regulations.

Senate bill: ease N-plant licensing

Bush repeated his call for enacting the National Energy Strategy. In related news, the Senate on Feb. 6 approved an amendment to the energy bill that would streamline nuclear plant licensing by combining the construction and operating license-approval process. The Senate hadn't acted on the full bill as of mid-February.

The budget's new nuclear fee would apply to any domestic nuclear generation that ever used DOE's enriched uranium as fuel. The fee, however, would be levied on current generation. Nuclear utilities suggest the fee doesn't account for utilities no longer buying fuel from DOE, or for non-U.S. utilities, which couldn't be charged. The estimated annual collection of $183 million would pay for cleanup of three federal enrichment sites.

DOE and EPA proposed spending for fiscal year '93 would increase compared to FY-'92. DOE was $19.4 billion, up from $19.04 billion, and EPA, $7 billion, up from $6.7 billion.

While DOE's energy supply research and development budget increases to $3.64 billion from $3.41 billion, coal R&D would drop from $300.9 million to $153.9 million. Clean coal funding is intact at $500 million for rounds four and five.

The total nuclear R&D budget would fall slightly. Nuclear fission funding fell. Fusion funding increased. Nuclear waste funding increased.

The budget again seeks to restructure power marketing administrations' debt payments, rejected by Congress last year and criticized by public power utilities. It would accelerate payments to the federal government by $398.7 million. Bonneville Power Administration's funding increase includes work on the third AC intertie. BPA said budget's debt repayment would be on a set mortgage amortization schedule, requiring faster repayment. BPA said the change would increase wholesale power rates by 11 percent and retail rates by 7 percent.

The budget also would cut Tennessee Valley Authority's federal funds (not used for utility operations) to $100.7 million, from an estimated $135 million.

In other budget items:

- DOE Secretary James Watkins plans to reorganize DOE national labs.
- The Department of Health and Human Services would cut by a third funding for Low Income Home Energy Assistance Program (LIHEAP). In addition, about 75 percent of the FY-'93 budget would be spent in FY-'92 to repay state and local money already spent.
- The Federal Energy Regulatory Commission and the Nuclear Regulatory Commissions both get increases, funded by utility fees.

Releases from federal departments and agencies and material from the Edison Electric Institute, American Public Power Association and National Coal Association contributed to this report.

Kansas utilities merge, $1B deal

TOPEKA, KS—Kansas Power & Light Co. received final regulatory approvals to acquire Kansas Gas and Electric and expects to complete the $1-billion deal by March 16.

Kansas Power & Light Co., which operates as KPL Gas Service, plans to operate KG&E as a subsidiary. The companies project a savings of $140 million within the first five years as a result of the merger.

KPL said no layoffs are planned. A voluntary retirement package will be offered to those 55 or older with 10 or more years of service. About 700 employees are eligible—just 100 from KG&E.

Offer ended takeover attempt

The KPL offer in 1990 ended what KG&E called an illegal and underpriced hostile takeover attempt by Kansas City Power & Light (*EL&P*, 12/90, p.1).

KG&E, based in Witchita, KS, has 250,000 electric customers and 1330 employees. KPL has more than 1 million gas customers and 306,000 electric customers and employs 4500.

Non-utility power records double-digit growth

Growth in non-utility generation continues, according to two recent reports.

Independent power producers (IPPs) were contributing 43.1 GW to U.S. electrical capacity at the beginning of this year, compared to 37.6 GW in January 1991, or an increase of about 14.6 percent, based on information in the RCG/Hagler Bailly Inc. "Profile of the Independent Power Market: 1992 Status and Trends."

For the rest of the '90s, RCG/Hagler Bailly estimated IPPs would add capacity of between 42 and 52 GW.

This continued growth and trends in similar statistics recently cited by Edison Electric Institute.

EEI said all non-utility generation (NUG) installed more generating capacity 1989-1990 than did all electric utilities. Utilities took half of NUGs' output, 116,528 GWh, an increase of 24 percent over 1989. This accounted for 4 percent of total U.S. electricity available for distribution, according to EEI's "Capacity and Generation of Non-Utility Sources of Energy."

From 1989 to 1990, all electric utilities added 4168.1 MW in installed capacity, growing to 735,051.4 MW, while NUGs added 4859.6 MW, growing to 45,126.7 MW, according to the December 1991 EEI report.

The average NUG project size was small at 12 MW, and the predominant fuel was increasingly natural gas, EEI noted. NUGs accounted for 6 percent of U.S. capacity. NUGs produced 8 percent of total U.S. generation in 1990, 232,781 GWh, representing an increase of 16 percent over 1989.

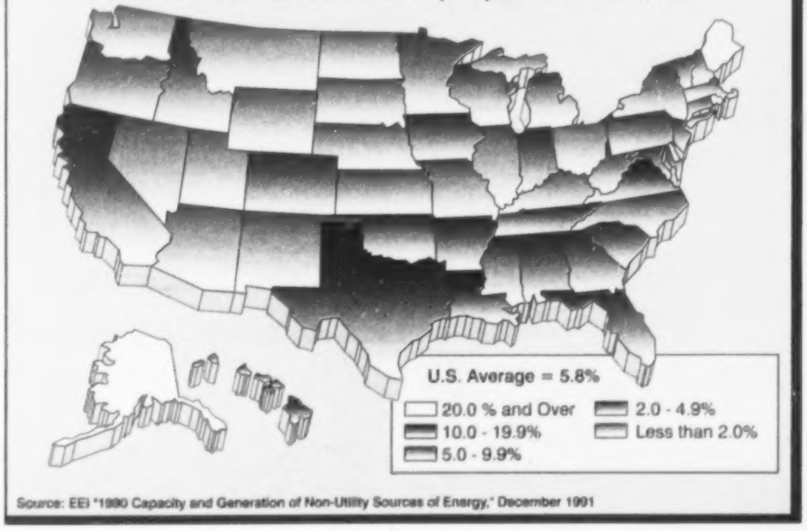
Just 9 percent was fully dispatchable: 67 percent had no dispatchability at the end of 1990, the EEI report said.

A report in April *EL&P* will project NUG growth to 2010.

Regional look at IPPs, NUGs

EEI said that in 1990, NUGs in Maine, Rhode Island, and Alaska provided 20 percent or more of total capacity there. More than 10 percent was provided by California, Hawaii, Texas, Ida-

Continued on page 4


Non-Utility Capacity by State
As a Percent of Each State's Total Capacity on December 31, 1990
U.S. Average = 5.8%
20.0 % and Over
2.0 - 4.9%
10.0 - 19.9%
Less than 2.0%
5.0 - 9.9%

Source: EEI "1990 Capacity and Generation of Non-Utility Sources of Energy," December 1991

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Toxics study recommends mercury emission controls

Relative Cost-Effectiveness of Mercury Emission Reduction Options (In 1990 Dollars)

	Average Cost for 500 MW Plant ($ Millions/yr)	Cost ($ Millions per Ton of Mercury)	Maximum U.S. Reductions Achievable (% in 2010)
Fuel-Switch: Coal to Coal	8-23	30-292	<15
N. Appalachia to S. Appalachia	8-23	98-292	<10
Gulf Coast to Rocky Mountain	8-23	30-92	<5
N. Dakata to Powder River	8-23	88-262	1
Fuel-Switch: Coal to Gas	120-147	338-660	15-40
Coal Cleaning	12	176	<10
Baghouse retrofit	6-8	66-524	<10
Replace Hot-Side ESP	8	66	<5
Replace Cold-Side ESP	6-8	420-524	<5
Scrubber Retrofit	24-33	244-334	25-30
Emerging Technology Retrofit	11	60	90

Source: Center for Clean Air Policy, "Electric Utilities and Long-Range Transport of Mercury and Other Toxic Pollutants."

WASHINGTON—While federal regulators and the industry study toxic utility emissions, a Washington, DC, environmental group is calling for a mercury emission trading system.

If the U.S. Environmental Protection Agency were to adopt Center for Clean Air Policy (CCAP) recommendations, utilities might spend $500 million to $1.25 billion a year by 2010 to reduce mercury emissions 15 percent from present levels, according to the study. Edison Electric Institute rough estimate for mercury control costs is $5 billion a year.

CCAP also calls for "greatly expanded" research, especially on human exposure through the food chain. It also wants electric utilities "to report and make public estimates of their toxic emissions."

Clean Air Act Amendments of 1990 (CAAA) require the EPA to study the health and environmental effects of mercury and other toxic emissions. The first of several EPA mercury studies for the CAAA is due in 1993. Regulations may result if deemed appropriate.

Regional concentrations shown

The CCAP November '91 report, "Electric Utilities and Long-Range Transport of Mercury and Other Toxic Air Pollutants," was based on a three-year study of utility toxic emissions. It was not connected to the EPA effort. CCAP says a significant part of high mercury levels in aquatic food chains results from mercury in the air.

Mercury, said CCAP, poses "significant threats to human health, wildlife and the environmental integrity of the aquatic food chain" through high mercury concentrations in fish.

Mercury effects seem to be worst in waters in the Great Lakes region, particularly in Wisconsin and Michigan. Since contamination also occurs in pristine waters, with no nearby development, the atmosphere is thought to contribute man-made mercury. The 1972 Clean Water Act prohibits mercury releases into water.

Utilities are not the only source identified, but "with emissions projected to grow by 10-35 percent over the next two decades, utilities will account for over half of all the remaining national man-made mercury emissions."

The CCAP board is comprised of current and former governors, and others, including Richard Abdoo, chairman and chief executive officer, Wisconsin Electric Power Co., Ohio Public Utilities Commissioner Ashley Brown, and John Palmisano of the emission's trading firm AER*X.

The study identifies options for control, estimates costs based on specific examples, and recommends the EPA regulate mercury emissions like the innovative and flexible sulfur-dioxide control plan, with a cap and trading system of allowances.

The report also lists and discusses other trace metals and their health effects, but says these effects might not be occuring now. These include arsenic, beryllium, cadmium, chromium, lead, manganese, nickel, and vanadium. Mercury, cadmium, and polycyclic aromatic hydrocarbons were listed as a "current concern." Nickel and vanadium were not of current concern. Effects of the others were called "uncertain."

Examples, costs, sources

The table on mercury emission options and cost of compliance assumes a plant with remaining life of 30 years, a 10,000 Btu/kWh heat rate and a 70 percent annual capacity factor.

Methods to reduce mercury include fuel switching (to low-mercury coal), energy efficiency, nuclear power and most renewable energy sources.

Coals from the Rocky Mountain states, the Illinois Basin and Southern Appalachia have relatively low average mercury concentrations.

As the table suggests, present emission-control technology is not as effective for mercury removal as for other pollutants. While CAAA compliance might significantly reduce mercury emissions, the report said, benefits "are not likely to be large."

Other major U.S. sources of atmospheric mercury, in addition to fossil power plants, are paint biocides and the burning of mercury batteries in waste-to-energy plants or incinerators. Recent decisions to eliminate mercury in paint, and reduce it in batteries, will cut those sources by 25 percent in 10 years, the report said. Other sources include mining, metal smelting and production of products containing mercury.

World-wide reduction

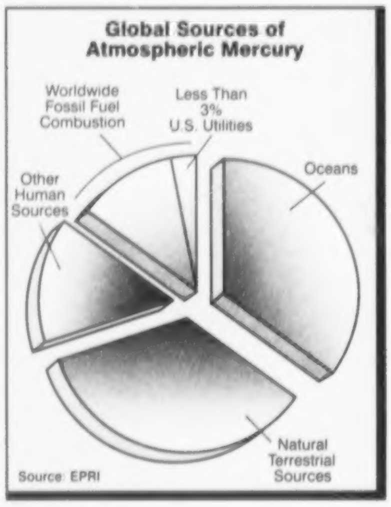
The report also suggests that the U.S. government participate in discussions about world-wide reduction of mercury emissions.

Estimates of man-made mercury emissions worldwide have been as high as 59 percent of total. The Electric Power Research Institute estimates global man-made emissions at 30-55 percent of the total. A small fraction of worldwide fossil fuel combustion is from U.S. utilities, EPRI says (see pie chart). EPRI has studies underway on mercury emission risk assessment.

Measurement proves difficult

Researchers concede that attributing a mercury to a source is difficult. Previous man-made emissions may be stored in water, soil, or sediments and show up again later as a "natural" source. Mercury measurement can be difficult because of small concentrations and danger of contamination. Partly because of the challenges of measurement, the estimated effectiveness of emission-reduction options has varied widely.

A conference on mercury as a global pollutant will be held May 31-June 4 in Monterey, CA. Information is available through EPRI, based in Palo Alto, CA.


Global Sources of Atmospheric Mercury

Source: EPRI

Effective communication raises support for nuclear energy

WASHINGTON—Efforts to effectively inform the public about the value of nuclear energy has increased support for nuclear power, according to a U.S. Council for Energy Awareness (USCEA) collection of 1991 opinion polls.

However, unclear information about nuclear power may do more harm than good, suggested Ann Bisconti, USCEA vice president for research.

"Unquestionably, good information is very, very effective in increasing support for nuclear energy," Bisconti said in an interview.

"But confused messages that use jargon," she warned, "may confuse the message." Bisconti cautioned that people with scientific backgrounds may have difficulty in explaining things in a way the public can understand.

Building a positive public image, Bisconti said, is one of the keys to gaining the acceptance needed to build the next generation of plants.

And awareness is gaining, according to USCEA. In 1990, 49 percent of respondents said they were very, or somewhat, well informed, about nuclear energy issues. In 1991, those categories grew to 63 percent of responses.

Education helps positive image

Polls showed that more people support nuclear energy when they:

- Are told using a higher percentage of nuclear energy can cut air pollution and emissions of suspected greenhouse gases.
- Become aware that the Nuclear Regulatory Commission monitors plants daily. (In one poll, just 7 percent said they knew this.)
- Read USCEA material about nuclear plant safety.
- Tour a nuclear plant. Demographics suggest that people with inclinations to favor nuclear plants are more likely to visit one. However, USCEA said polling at visitor centers also suggests that a visit improves opinions, regardless of visitors' original views.
- Are reminded that radiation is beneficial and are shown examples that its use is under control.
- Learn that its use has reduced dependence on foreign oil.

In addition, when asked to choose between having waste-disposal facilities or giving up nuclear energy for electricity and medicine, people supported building waste-disposal facilities by 80 percent to 12 percent. Not surprisingly, people offered more support when it was called a "disposal facilty" than when it was called a "dump."

USCEA television and print advertising had a positive impact.

"Overall favorability to nuclear energy increased significantly more among those who remembered seeing the ads than among those who did not remember," a USCEA statement said. Nearly half of those polled remember seeing USCEA ads in 1991. For the year, the ads had potential reach of 157-million Americans with an average 13 exposures.

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COMMENTARY

Conservation will not eliminate the need for new base load capacity

Grandiose claims from some utilities for estimated conservation savings to be achieved in future years are sending misleading signals.

At a recent meeting I attended, a manager with a major generating equipment supplier expressed concern that utilities would not need his company's product any more. Demand-side management and conservation programs, he pointed out, will cancel out most of the electrical demand growth in the 1990s—according to what he reads in the papers.

These claims are proliferating. Conservation and DSM, they trumpet, are eliminating the need for new generation and transmission facilities. I have to admit that we report our share of these claims. If utilities make them, we report them.

However, I think we also have an obligation to put them in a better perspective. One utility recently claimed that of the estimated demand growth of nearly 1400 MW in its service territory over the next decade, conservation would take care of nearly 800 MW and no new base load power would be needed. The emphasis in the announcement was on the conservation claim. The announcement also said, almost in passing, that the utility also planned 500 MW of new generation. It seems to me that what this utility is really saying is that it plans to meet 500 MW of near-term demand growth with new capacity. That new capacity will be short-leadtime, non-baseload power plants built by non-utility entities. The utility clearly hopes to reduce additional demand with conservation, but it has the option of meeting additional demand—at the last minute— with more new, short leadtime NUG capacity. The estimates for total demand and conservation are just that—estimates. The new capacity plan is real.

The large conservation estimates that precede new capacity announcements these days are unrealistic, in my opinion. They may be necessary in order to make new capacity plans politically acceptable, but I hope we all take them with a grain of salt. Is there any documented case where a utility, or anyone else, has actually achieved hundreds of megawatts of demand reduction through conservation, or any other demand-side program? I've seen documented cases of DSM programs aimed at peak shaving that have cut power demand, but the cuts are on the order of tens of megawatts.

This is not a diatribe against demand-side management. I think it's a good development. We sponsored a conference on distribution automation and demand side management in January and there's a feature article on the subject in this issue. The focus, as you can see, is on realistic, actual programs: real-time pricing, new communications technologies, new approaches to load shedding and peak shaving, and advanced metering.

Most states have adopted formal integrated resources planning programs—some call it least-cost planning or something else—that require utilities to include demand-side programs in their plans. Many states are also adopting rate incentives for utility involvement in conservation programs that, after all, are intended to reduce demand for utilities' basic product.

However, many DSM programs do not reduce demand for electricity. They shape demand via real-time pricing or direct-load control to take better advantage of power system economies. They make electricity a better bargain for the buyer—which paves the way for load growth.

Load management, a form of DSM aimed at peak demand reduction, has been actively pursued by utilities for at least 20 years. If DSM can eliminate new demand, why are we in a simple-cycle gas turbine buying boom right now? My answer to the equipment supplier manager who was worried about the future was to tell him to go talk to gas turbine suppliers. I'm sure that demand for gas turbines is less than it would have been without utility load management programs. How much less no one knows, but peak power growth has not been cancelled by DSM.

Likewise, base load power demand will not be cancelled by conservation and DSM in the 1990s. It will be reduced somewhat, but there will be extensive need for new boilers, steam turbines, transmission systems, and all the other equipment required to support new base load power. EPRI estimates that DSM will cut demand by 30% in the 1990s. Even that seems high to me, but if it's true it leaves 70% of the demand to be met by new capacity.

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Candidates' energy views follow political party lines

CONCORD, NH—Energy America, a coalition of New Hampshire environmental, consumer and sustainable energy organizations, released a survey of presidential candidates' energy policies on Feb. 10, prior to the state primary.

The survey showed that the group's energy agenda closely matches the energy views of Democratic candidates. It graded both Republicans "D," and all five Democrats "A."

Democratic candidates favored and Republican candidates opposed, the following issues, with the exceptions shown:

- Raising auto fuel economy standards.
- Shifting DOE funding to energy efficiency and renewables.
- A carbon tax. Brown, Clinton, Harkin, Kerry qualified their answers.
- Accelerating elimination of certain ozone-depleting chemicals. Bush supported.
- Development of solar/hydrogen fuel systems.
- Reducing U.S. energy use by 10 percent by the year 2010. Bush qualified his answer.
- Tripling contribution of renewables. Bush, no answer (NA).
- Full support of the Endangered Species Act.
- Re-evaluation of U.S. nuclear waste policy. Buchanan, NA.
- Rights of state for stricter-than-federal radiation laws. Buchanan, NA. Bush qualified his answer.
- Whistleblower protection. Buchanan, Bush, supported.
- U.S. leadership on international agreements on environment. Bush qualified his answer.

Republican candidates favored, and Democrats opposed, the following issues, with the exceptions shown:

- One-step nuclear plant licensing.
- Oil and gas development in Arctic Wildlife Refuge.
- Yucca Mountain and Carlsbad "nuclear waste sites." Buchanan, NA. Harkin supported.
- Shift to taxpayer liability for "low level" nuclear wastes. Kerry qualified. Buchanan, NA.
- Below regulatory concern policy for nuclear waste. Buchanan, NA.
- James Bay hydroelectric facility. Buchanan and Bush, NA. Clinton, Harkin, Kerry qualified their answers.

Energy Coalition's grading of the survey gave "half credit" for qualified answers and no credit for unanswered questions. Energy Efficiency Education Project, based in Washington, DC, distributed the release.

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from page 1

Non-utility power...

ho, Louisiana, and Virginia (see map).

Leading IPP generators by state at the beginning of 1992 were New York with 8.6 GW, followed by New Jersey with 7.2 GW, Florida at 6.9, California with 4.5, and Massachusetts with 4.3 GW, said RCG/Hagler Bailly.

The single, most active state for IPP announced capacity under development at the beginning of '92 was Florida, for the second year running, with a total of 3.7 GW. After Florida, the highest numbers were for New Jersey, New York, and California, each with over 2.0 GW of capacity under development, the RCG/Hagler Bailly report said.

By area, the largest jumps in project announcements were in the South Atlantic region (9 GW), the Mid-Atlantic (7 GW), and the Pacific region (4 GW).

In another type of comparison, 224 IPP projects were brought online in 1990 to add a total new capacity of 6.4 GW, which was about 23 percent more capacity than the 5.2 GW that became operational in the 165 new projects completed in 1991, said RCG/Hagler Bailly.

How much, what kind

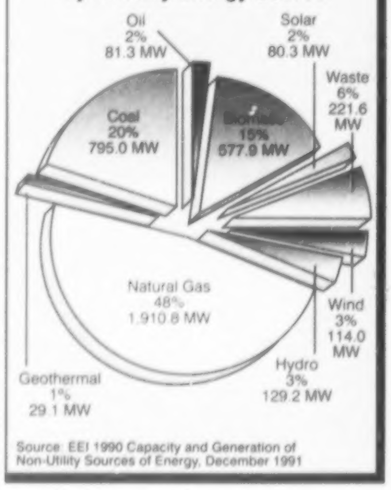
All newly announced IPP projects in '91, not those just expected to be completed in that year, had a capacity of 25.5 GW. At the start of '92, more than 66 GW were under construction or being planned, compared to 60 GW at the start of '91.

The fuel mix of IPP projects did not change as much 1991-92, said RCG/Hagler Bailly. Natural gas accounted for 45 percent of the generation capacity in '91 and for 47 percent in '92. Coal and waste coal were at 22 percent and 21 percent, respectively. Renewable energy and waste fuels composed 33 percent of '91's IPP capacity and 31 percent of '92's.

According to RCG/Hagler Bailly, the breakdown of active IPP projects by prime mover in January '92 were:

- Boiler/steam turbine—16.7 GW operating and 18.1 GW under development.
- Combined cycle—15.3 GW operating and 26.6 under development.

Non-Utility Capacity Placed in Operation During 1990 by Primary Energy Source



Source: EEI 1990 Capacity and Generation of Non-Utility Sources of Energy, December 1991

- Combustion turbine—5.2 active and 7.1 being developed.
- Reciprocating engine—0.7 GW operational and 0.3 GW under development.

According to EEI, non-utility generators:

- Were 73 percent cogenerators, and 21 percent small power producers, by type of producer at the end of 1990.
- Used mostly natural gas for new NUG capacity in 1990, at 48 percent (see chart), up from 41 percent of total NUG projects using the fuel. At 49 percent, the most common NUG prime mover is steam turbines; combustion turbines contributed 44 percent.
- Showed an annual capacity growth rate of 16 percent, 1987-90.
- Were small. A total of 72 percent of projects' capacity were less than 5 MW. Just 3 percent was 100 MW or more. Projects 100 MW and over accounted for 42 percent total capacity.
- Appeared to grow fastest in two industries over four years. Paper industry capacity there grew 44 percent; generation grew 40 percent. Chemical industry capacity grew 33 percent and generation grew 59 percent over the same period. The chemical industry leads paper in total amount of generation, 23 to 19 percent.

FERC decision on transmission access helps NU/PSNH merger

HARTFORD, CT—Progress was made recently on the Northeast Utilities/Public Service Co. of New Hampshire merger deal when the Federal Energy Regulatory Commission (FERC) approved an amended decision on the proposed merger. The amended decision modifies transmission-access conditions that FERC had attached to its approval of the merger (see *EL&P* 2/92, p.11).

Customers held harmless

As a result of the decision, NU and PSNH customers will be held harmless if other utilities and power producers in the Northeast need to use the NU/PSNH transmission system to buy or sell electricity, explained William B. Ellis, NU chairman and chief executive officer.

"While this decision does not make all the changes we requested last summer, it apparently does address the critical issue—transmission access—in a manner that treats NU and PSNH customers fairly. It is important to note that the work by the states of New Hampshire and Connecticut was critical in convincing the FERC commissioners to make the necessary changes to assure protection of ratepayers in those states.

Push ahead

"Based on our initial reading of the amended decision, we believe this decision should allow us to push ahead promptly with the remaining steps necessary to complete a merger that is nearly four years in the making," Ellis stated.

Under the merger plan, NU would acquire PSNH's 35.6-percent share of the Seabrook nuclear power plant and become managing agent responsible for operating Seabrook. NU said the deal would save PSNH and its customers an estimated $600 million over its lifetime and save NU and customers in Connecticut and Massachusetts $350 million.

New plants were small in 1991, no nuclear

WASHINGTON—In 1991, for the first time since 1967, no new nuclear plants went into operation, according to a recent Utility Data Institute (UDI) report.

UDI's latest edition of "Projected Capital Costs: U.S. Power Plants" found that of the 39 new power plants that did enter service last year, the average unit size was quite small. UDI statistics show a 76-percent decrease in average unit size over the past five years, from 574 MW in 1986 to 139 MW in 1991.

New capacity in 1991 totalled 5435 MW. A breakdown of total new capacity showed: coal-fired, 2989 MW; gas-fired, 1003 MW; hydroelectric, 1146 MW; and oil-fired 297 MW.

Planned capacity

UDI also reported that 47,188 MW of new utility generating capacity is scheduled for service between 1991 and 2000. Planned capacity includes: 10,298 MW now under construction; 5712 MW tied up in delayed coal and nuclear units; and 25,739 MW of capacity planned and in design.

U.S. nuclear units still under construction include Comanche Peak-2, scheduled for completion in 1993, and Watts Bar 1 & 2, expected to begin service before 2000.

Electric Utilities at a Glance

	Total Electric Utility Industry	Investor-Owned Utilities	Municipals	Cooperatives	State Projects, Public Power Districts	Federal Power Marketing Agencies
Installed Generating Capacity (kW in thousands)	735,051	568,769	40,115	26,337	34,397	65.434
% of Total	**100**	**77**	**5**	**4**	**5**	**9**
Generation (kWh in Millions)	2,807,058	2,201,007	97,670	126,115	146,994	235,272
% of Total	**100**	**78**	**4**	**5**	**5**	**8**
Customers (at December 31st)	109,958,503	84,228,417	12,764,526	10,846,117	2,092,189	27,254
% of Total	**100**	**77**	**12**	**10**	**2**	**>1**
Energy sales (kWh in thousands)	2,673,596,479	2,060,673.455	294,831,533	184,783,173	78,466,423	54,841,895
% of Total	**100**	**77**	**11**	**7**	**3**	**2**
Revenue (Thousands of Dollars)	$175,919,698	$139,447,850	$18,071,621	$12,766,462	$3,953,237	$1,680,528
Average Revenue per kWh from Total Sales	--	6.77¢	6.13¢	6.91¢	5.04¢	3.06¢
Average Revenue per kWh from Residential Sales	--	8.17¢	6.48¢	7.51¢	5.96¢	5.71¢
Number of Electric Generating Plants	3,437	1,988	1,049 (a)	215	(a)	185

Note: Total may not equal sum of components due to independent rounding.

(a) Breakdown of Municipals, State Projects and Public Power Districts data not available, only total for Publicly-Owned Electric Utilities is shown.

Figures are preliminary 1990, except for Installed Generating Capacity and Number of Electric Generating Plants which represent final data.

Source: EEI, "1990 Statistics Non-Investor Owned Utilities," December 1991.

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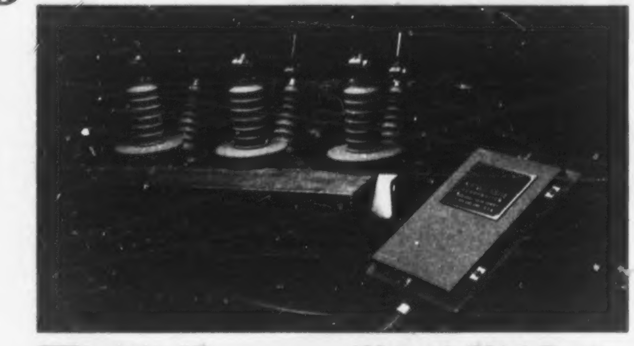

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Inquire R.S. 6

POWER PRODUCTION UPDATE

HENRY STEIN, Senior Editor-Power Production

Thermal energy storage improves combustion turbine operation

Jerry A. Ebeling
Project Manager
Burns & McDonnell Engineering Co.
Kansas City, MO

Thermal energy storage (TES) inlet air cooling is a new concept that is an economical, feasible method for increasing the peak capacity rating of combustion turbines. The benefits of a short design/construction schedule and added capacity at a low cost per kilowatt make it an attractive option to utilities approaching their peak capacity.

Most combustion turbines are used for peaking duty during the summer months when residential and commercial cooling loads are the greatest. Ironically, this same hot weather sharply lowers the turbines' capacity ratings. In other words, a utility buys seriously derated capacity when it installs such a turbine for peaking service.

However, cooling the ambient air before it enters the bell mouth of the combustion turbine allows the peak rated capacity of the machine to be used when it is needed most.

Current application

TES technology for combustion turbine inlet air cooling is being applied by Lincoln Electric System, Lincoln, NE. System operation began in September 1991 at the utility's Rokeby Station, as a retrofit to an existing General Electric Frame 7B peaking unit with an evaporative cooler rated at 65 MW at 100°F. The inlet cooling was expected to increase the turbine's capacity by 25 percent.

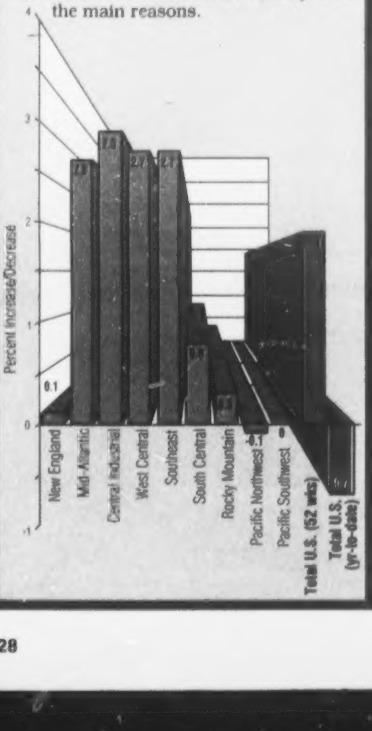
The Rokeby TES system is the largest of its kind in the U.S. and the first application of ice harvesting for inlet air cooling.

The combustion turbine had been installed in 1975. The TES addition cost a little over $2 million and added 11 MW to the 100°F capacity. In addition, redesigned inlet guide vanes cost about another $160,000 and added an extra 2 MW to the turbine's capacity, and converting from oil burning to gas burning cost $400,000 and added another 1 MW. The entire project took less than a year.

ELECTRIC OUTPUT

Growth Slowed More

Changes in net electric output from the Mainland U.S. electric utilities varied widely for the 52 weeks ending Jan. 25, as reported by Edison Electric Institute. Variations in weather in the country were the main reasons.



The system's ice tank holds 1.1-million gal of ice and chilled water (at about a 9:1 ice-to-water ratio). If final results this summer match preliminary tests, Lincoln Electric plans to include chillers with all combustion turbines it installs in the future.

Burns & McDonnell provided detailed design and procurement; the Electric Power Research Institute and the American Public Power Association provided partial funding.

Inlet air cooling primer

A combustion turbine is a mass flow machine—greater air mass flow through it creates higher generating capacity within its design limits. As air temperature decreases, it becomes more dense, and a compressor with a fixed volume flow rate can move more air mass than at warmer temperatures—the compressor's capacity and efficiency increase at lower temperatures.

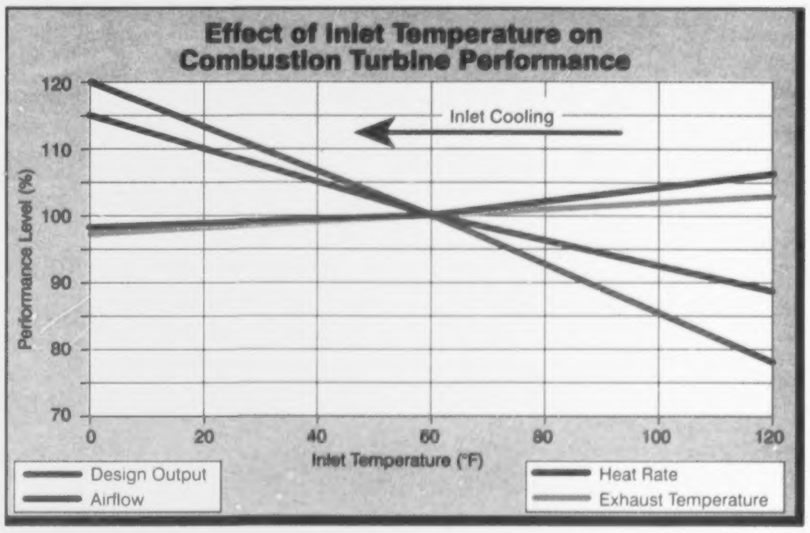
Thus capacity, heat rate, fuel flow, exhaust temperature, and efficiency are all related to combustion airflow ambient temperature (see figure). The most significant benefits to inlet air cooling include:

- *Increased capacity*—The greatest benefit is to increase unit electrical generating capacity during periods of high ambient temperatures. Manufacturer's performance curves indicate up to a 24-percent increase in capacity on a 100°F day. For example, on a GE frame 7EA, the increased capacity equates to approximately 17 MW at 40°F over the 100°F rating of 73 MW.
- *Improved efficiency*—Inlet air cooling increases system efficiency by operating the turbine at a lower heat rate at lower ambient temperatures. Manufacturers' performance curves predict that unit heat rate decreases by approximately 4 percent between 100°F and 40°F.

Fuel cost savings from the efficiency gain can offset the operating cost of running the TES refrigeration system on offpeak energy. This estimate is a utility-specific parameter that depends on the cost of fuel and offpeak energy.

- *Life extension*—Since the combustion turbine runs cooler with TES, its components' lives are extended. However, no quantitative estimates are yet available concerning life extension or maintenance cost savings due to inlet air cooling.
- *Delayed new generation*—By adding inlet air cooling to existing combustion turbines, the resulting capacity increase may be enough to delay the installation or purchase of new capacity for one or more years.
- *More efficient use of baseload capacity*—TES inlet air cooling produces ice during offpeak hours on economical power. The resulting increase in baseload capacity factor also provides better management of a utility's baseload capacity and perhaps a slight improvement in overall system efficiency.

Ice harvesting system



Several approaches can be used in design of a TES system, one of which is "ice harvesting," as used at Rokeby, in which a refrigeration system produces ice that then is stored in a tank until used to cool the inlet air. The three basic ice-harvesting cycles are daily, weekly, and yearly. Each cycle's best applications depend on combustion turbine operation and site-specific economics:

- *Daily*—This cycle produces the required quantity of stored ice every day. A TES system for a baseload combustion turbine requires a daily cycle. Another application is where the cost of energy does not vary throughout the day and week, and the cost of the refrigeration system can be balanced against that of a larger ice storage tank.

The equipment required includes a small ice storage tank and large refrigeration system.

- *Weekly*—A weekly cycle produces enough ice to balance the weekly thermal cooling requirements of the combustion air. The cycle is ideal for a combustion turbine operation that requires peaking capacity a few hours a day, for five or fewer days per week.

Operating a weekly cycle requires a moderately sized ice storage tank and refrigeration system.

- *Yearly*—A yearly TES cycle produces ice continuously to provide the total yearly combustion air cooling requirements. It is used when rare, short-duration peaking requires reserve capacity and/or when energy cost is high continuously.

Yearly cycle requirements include a large ice storage tank and small refrigeration system. A yearly cycle would not be economical for most utilities.

Short leadtime

A TES inlet air cooling facility can be designed, procured, installed, and operational in less than one year, as proven out at Rokeby Station. Currently, the longest lead-time item to manufacture is the large, high-voltage (4160-V) motors for the refrigeration compressor and the circulating water pumps. These units may require up to 20 weeks from release to manufacturer to job site delivery.

However, the ice storage tank takes the longest to construct. Depending on construction methods, it may take up to three months after contractor mobilization to excavate, construct, and test the tank.

Cost of a TES inlet air cooling facility depends on:

- *TES cycle*—A daily cycle requires a smaller ice storage tank, but larger refrigeration system and higher operating cost than a weekly cycle.
- *Ambient conditions*—As wet and dry bulb design temperatures increase, so does the required size of the ice storage tank, inlet air cooling heat exchanger, circulating water system, and refrigeration system.
- *Site-specific conditions*—Retrofit of TES inlet air cooling onto an existing plant site with limited land availability is more expensive than designing it for a new site with a new combustion turbine.
- *System control and monitoring*—A simple on/off operation is less expensive than full programmable logic controls with system monitoring and reporting.
- *Construction quality*—Utility-grade quality materials and construction are more costly than comparable commercial- or industrial-grade.

A complete TES inlet air cooling facility based on a weekly TES cycle, 100°F dry bulb, 70°F wet bulb, existing combustion turbine site, computer-controlled, of utility-grade quality can be installed for approximately $200/kW. This estimate is based on a GE frame 7EA unit and should only be used for initial economic feasibility purposes.

Economics

Peak electrical generating capacity is normally only used a short period of time each year (1000 hr or less), or as unused reserve capacity. But peak generating capacity does not need to provide economical electrical energy. The lowest initial-capital-cost capacity is usually installed for peaking duty, with less concern given to variable operating costs.

The simplest comparison is between the incremental installed cost of a TES system and other forms of new or purchased peaking capacity. Based on this type of evaluation, the estimated break-even period is between two and three years.

Even with the improved efficiency inlet cooling brings to a combustion turbine, the total system net heat rate increases by approximately 4 percent. This is a result of the energy requirements of the TES refrigeration and circulating water.

However, the total system variable operating cost per kilowatt of a TES inlet air cooling/combustion turbine system is, in most cases, equal to or only slightly higher than (less than 1 mill/kWh) a simple-cycle combustion turbine without inlet cooling. This is because high-priced peaking fuel (natural gas or fuel oil) can be replaced with lower-priced, base-capacity fuels such as coal or nuclear.

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ELECTRIC LIGHT & POWER
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VOICE OF THE ELECTRIC UTILITY INDUSTRY

LATE NEWS

Electric Power Research Institute authorized $12 million over three years for "cold fusion" research. Funding may hinge on future experiment results and on an investigation of a fatal accident. EPRI already spent $2 million. Department of Energy halted funding for cold fusion in 1989.

Shutdown and investigation at Wolf Creek nuclear unit delayed merger of two Kansas utilities.

Kentucky Utilities Co. and East Kentucky Power Co-op bought six 100-MW ABB Power Generation gas turbines for $130 million.

Energy legislation reshapes industry

Industry groups lobby for last-minute changes

WASHINGTON—Attention to energy policy and debate about the structure of the electric power industry intensified as the House and Senate look ahead to working out a compromise in energy legislation.

The administration is likely to sign into law a compromise energy bill worked out by a conference committee. Lobbying is expected to intensify as the legislation draws closer to final form, possibly entering conference in April.

The resulting new, comprehensive energy package, under discussion in various forms for several years, would drastically change how the industry operates. The Senate passed its version, S.2166, on Feb. 19.

Markup on H.R. 776 was completed on March 11 as the Energy and Commerce Committee approved the bill by 42-1. Amendments included provisions on reliability, and transmission access/retail wheeling with native-load protections. Changes also broaden appliance efficiency standards, making them more in line with industry standards. Another change promotes industrial energy efficiency by encouraging states to work with utilities and federal grants for trade associations, according to House energy staff. Additional changes could occur on the floor.

It's unclear what a House-Senate compromise would contain. The House version, as of this writing, didn't include provisions to streamline nuclear plant licensing, while the Senate bill doesn't address open transmission access. The House bill also seems to provide more consumer protections, while the Senate version relies more on free-market principles.

House staff noted that a revision to the Public Utilities Holding Company Act is the "red-hottest" provision.

The Senate bill passed with a resounding 94-4 vote. The legislation, an amended rewrite of year-old bill, S.1220, left out controversial provisions on drilling in a protected Arctic area and on auto-efficiency standards.

Sen. J. Bennett Johnston (D-LA) and Sen. Malcom Wallop (R-WY) sponsored the bill, which passed a year after President Bush released the National Energy Strategy.

While the Department of Energy and administration isn't completely satisfied with the Senate bill, a veto seems unlikely if what emerges from conference committee is similar. (See related story for a one-year update of NES).

The Senate bill included:

- Revisions in the Public Utility Holding Company Act of 1935 and the Federal Power Act with proposed creation of Electrical Wholesale Generators. EWGs would be exempt from PUHCA, and could be owned by holding companies, utilities, or non-utilities. A few restrictions protect consumers. State regulators say EWGs would shift regulatory powers toward federal regulators. The House bill has PUHCA revisions.
- Streamlined nuclear plant licensing.
- Promotions for renewable energy sources, energy conservation, alternate-fuel vehicles, including electric, and advanced clean-coal and nuclear-power support. The House bill includes similar language.

Investor-owned utilities generally oppose changes to their control of transmission resources. Wholesale interests want protection from competition with utilities, but they also want open access. The Large Public Power Council prefers voluntary involvement. Cooperatives and municipals like access, but with protections.

High testing costs close life-extension pioneer

Mark T. Hoske, News Editor

The high cost of required testing and low cost of replacement power justified the permanent closing of the Yankee Rowe nuclear plant, said the plant's operating company.

The announcement is significant for the nuclear industry. The 32-year-old unit had been a likely candidate as first to apply for an operating license extension and pave the way for the rest of the industry.

A statement from the operator said, "the interest of consumers would be best served by permanently shutting down the Yankee plant and buying less costly, available power over the next eight years" of the operating license.

The industry downplayed the decision's effect on nuclear plant relicensing efforts, even though nuclear industry opponents hail this as a victory.

The industry had previously targeted the plant for relicensing, but anti-nuclear forces then claimed core embrittlement made Rowe's operation unsafe. Several studies and discussions with the Nuclear Regulatory Commission led the operator to close the plant voluntarily in October 1991 to start embrittlement testing sooner than planned.

Northern States Power's Monticello plant, a boiling water reactor, is now the likely candidate as the first to relicense. Jim Lang, director for engineering and operations at the Electric Power Research Institute, said in late February, that a pressurized-water reactor replacement for Rowe hadn't been chosen yet to demonstrate relicensing. Lang said a subcommittee is working on it.

The Feb. 26 decision ends Rowe's 32-year operating life. The plant boasted a 74.3-percent capacity factor and 78.3-percent availability factor. The industry averages are 64.2

Continued on page 11

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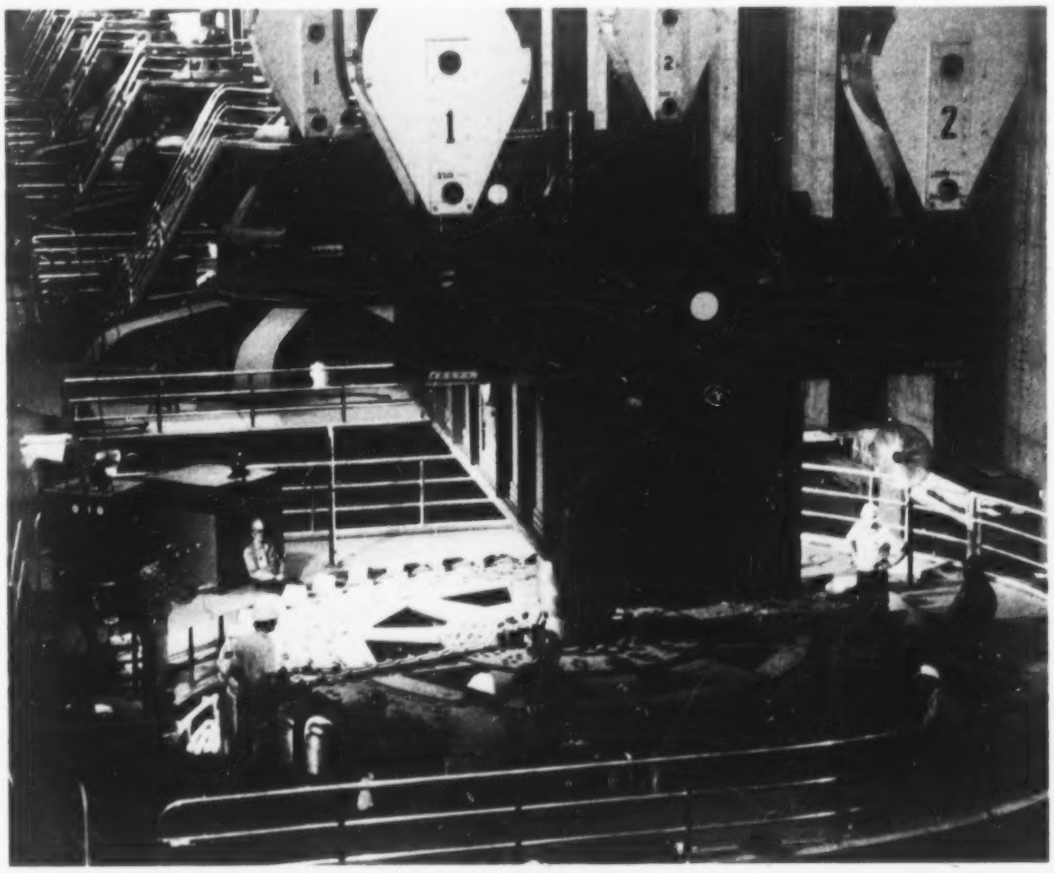

Hoover Dam upgrades serve as model

Upgrades at Hoover Dam served as a model for Hydropower 2002, an extensive Bureau of Reclamation efficiency and reconstruction program involving 52 hydro plants. More than 500 MW in upgrades were identified at Hoover alone. Here, a generator rotor is shown. See the full report starting on p.19.

Gas pipeline deregulation will affect fuel supply contracts

CHICAGO—Natural gas industry deregulation rules due out this month could hit electric utilities with long-distance pipeline contracts "like appendicitis—they'll feel a sharp, intense pain, doubling them over," warned James Bowe, partner in the law firm Hunton & Williams, at a recent conference here.

Bowe, whose firm specializes in energy law, noted that the "Mega-NOPR," the massive Notice of Proposed Rulemaking issued for the gas pipeline industry by the Federal Energy Regulatory Commission July 1991 is due to become a formal proposal this month. A final rule is scheduled to be put into effect between October 1992 and January 1993.

Purpose of the new rule is to increase competition, open access to pipeline services, and allow market pricing to replace FERC-imposed rates where possible. Major impact would be on 86 long-distance gas-pipeline companies and their customers.

If "Mega-NOPR" becomes "Mega-Rule," Bowe added, it "will rewrite the rules under which natural gas is transported, bought, and sold." It would also "profoundly affect each electric utility that purchases or transports natural gas for its own consumption, each utility that purchases power from others who use gas, and each utility that competes against other electric utilities that rely on gas."

Bowe made his comments at a conference on natural gas for electric power generation jointly sponsored by the Institute for Gas Technology, an arm of the gas industry, and the Edison Electric Institute.

The main reason for the sharp pain to current pipeline users, Bowe explained, is the provision in Mega-NOPR that would re-allocate existing interstate pipeline capacity by forcing abandonment and renegotiation of existing contracts.

Uncertainty slows projects

Bowe noted that he represents some cogeneration projects that were financed years ago on the basis of long-term gas supply contracts that now may be "by the board." Bowe questioned how the investment community would react to this re-allocation. He said he is involved in two power generation project financings right now in which the banks will not close until the final rule is out and they see what it is.

For utilities and other power generators with no current commitments, the reallocation of pipeline capacity would be a "great equalizer," giving them an opportunity to acquire transportation capacity, said Bowe. "Regardless of whether an electric utility is a 'have' or a 'have-not,' it will be well advised to participate in the proposed restructuring proceedings," he suggested.

Another provision of Mega-NOPR that would affect electric utilities is the unbundling of pipeline services such as transportation services, storage services, and gas sales. Rate setting mechanisms also would change. Curtailment priorities are altered. Electric utility gas customers have a major stake in all these changes.

Financial weakness

Increased competition and increased uncertainty due to these proposed changes will increase the risks in the gas pipeline industry, pointed out Marcus Dash, a partner in the investment firm, Goldman, Sachs & Co. at the conference. That could be a problem because the gas pipeline industry is financially fragile, he explained: "Pipeline company credit strength is pretty awful."

Dash noted that the securities of the "preponderance" of pipeline companies are rated BBB, the lowest investment grade—the rating one notch above the "junk" level. There was a 23-percent decline in the average rating during the 1980s, he noted. Virtually the entire industry was recently put on "credit watch" status by one of the security rating agencies, a warning that ratings could fall further. Recent bankruptcies of major pipeline companies also has the financial industry jittery.

Major source of the weakness has been what the gas industry sees as extremely depressed gas prices. Now, Mega-NOPR provisions such as the annulment of existing contracts adds to the uncertainty.

Kenneth Lay, chairman of Enron Corp., a pipeline company in good financial standing, agreed with Dash at the conference, saying, "We have a very fragile industry financially." Noting the recent bankruptcies, he warned that one or two other companies are vulnerable.

Sources of current problems

Lay blamed many of the current problems in the industry on regulatory overkill in the 1970s such as the 1978 federal Powerplant and Industrial Fuel Use Act that banned gas fuel for base-load power plants. The gas industry went from being a 20 trillion-cubic-feet per year industry in 1980 to a 16 TCF industry by the late 1980s, noted Lay. Deregulation (and repeal of the fuel use act) has improved the situation, but low prices are retarding a return to financial health. Lay noted that drilling for new gas is currently depressed with the fewest drilling rigs in operation since the 1930s.

50th annual meeting: Co-ops support $700-M boost in loans

ANAHEIM, CA—The National Rural Electric Cooperative Association passed 53 resolutions at its 50th Annual Meeting, including qualified support for transmission access.

On another topic, Bob Bergland, NRECA executive vice president and general manager, expressed support for a rural economic development legislation that would add $700 million to Rural Electrification Administration's (REA) insured loan program. NRECA says the money would create 20,000 jobs by helping finance long-delaying rural electric plant construction, replacement and maintenance.

NRECA resolutions:

- Support transmission access, but seek curbs on self-dealing and cross-subsidies in any changed holding company law.
- Support REA's action to protect co-op territory, and state and local efforts to resolve disputes and compensation agreements.
- Question computer predictions of global warming and calls for funding for more research.
- Back compensation for consumers whose hydro facilities are affected by federal water policy changes.
- Request time to allow improvement of REA loan rules.

After a year-long study, NRECA staff would like 12 months to revise seven loan procedures prior to any privitization of the REA insured loan fund. NRECA is attempting to work with REA to streamline loan process, which would help end delayed construction. The revisions aim to make alternate sources of financing easier to use and modify rules concerning prepayment of refinancing of high cost Federal Financing Bank loans.

Also at the Feb. 9-12 annual meeting, the NRECA board re-elected the association president, Jay York, a Minnesota grain farmer.

NRECA represents about 1000 rural electric borrowers serving 25-million customers in 46 states.

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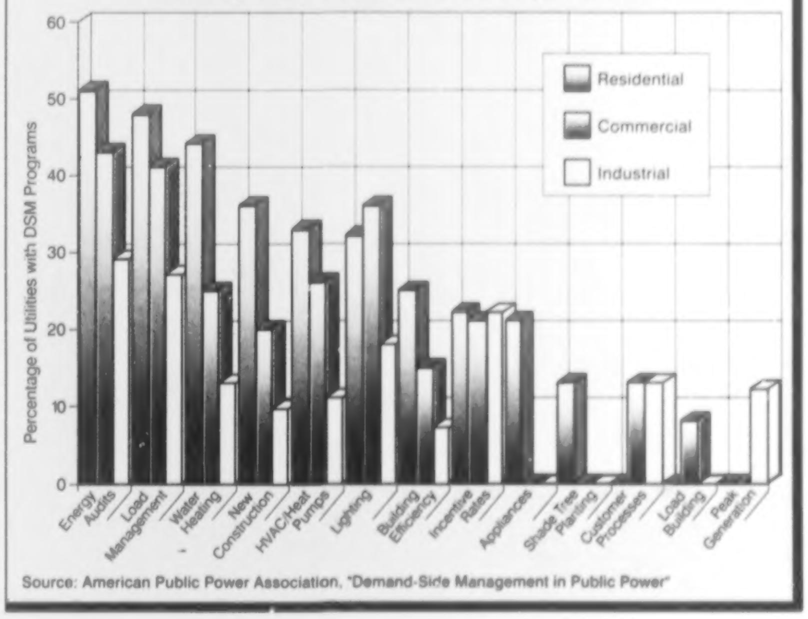
Leading DSM Programs at Municipal Utilities



Source: American Public Power Association, "Demand-Side Management in Public Power"

Municipals expect growth in DSM spending

WASHINGTON—Municipal utilities spent $253 million on demand-side management measures in 1991 and expect to spend $453 million by 1994, a 79-percent three-year gain, according to a survey by the American Public Power Association.

The accompanying report, "Demand-Side Management in Public Power—The Quiet Revolution," says municipal utilities account for 17 percent of total utility spending on DSM, even though their revenues are only 13 percent of the total.

2.1% of revenue spent on DSM

The average utility responding to the survey spent 2.1 percent of gross revenue on DSM programs. In a statement on the report, APPA Executive Director Larry Hobart said public power utilities "are taking strong action to save energy and increase efficiency without the kind of bottom-line demand for returns on investment that investor-owned utilities say they need to get into DSM."

Forty-eight percent of 851 responding utilities had 2155 active DSM programs in 1991 (see graphic). The summer 1991 survey was sent to 2039 utilities. Among respondents, two-thirds served 3000 or fewer meters. The average was 1750. Los Angeles Department of Water and Power was the largest with 1.3-million meters.

Surplus capacity

Of the respondents, 46 percent said they had surplus capacity; 50 said they had a "capacity balance," several years away from needing additional capacity.

Survey respondents reported that DSM cut peak demand by 3.9 percent in 1991. This compares to an Electric Power Research Institute all-utility estimate of 3.7 percent in 1990.

Barry Moline, APPA's DSM program manager, conducted the study. He said, "Public power utilities are effectively delaying the need to build new power plants, saving their customers money." Moline said the survey "confirmed our intuition about how solid and aggressive the [DSM] programs are out there."

State regulators support Clean Air Act guidance; oppose N-waste spending cap

WASHINGTON—State regulators took actions to try to protect ratepayers' $8.4-billion investment in the high-level nuclear waste program. They also set guidelines related to Clean Air Act Compliance and resolved to protect state jurisdictional rights in national energy legislation.

At the 1992 Winter Meeting, the National Association of Regulatory Utility Commissioners (NARUC) resolved to support:

- Principles for states to follow when regulating utilities' compliance with the Clean Air Act Amendments of 1990. The principles, assembled with the help of the Keystone Center, include regulatory guidance for forming the compliance plan and regulatory review prior to and during implementation. An accompanying interim report provides detailed guidelines for commissions ranging from pre-approval of compliance plans to after-the-fact review.
- An attempt to pursuade Congress to return to states jurisdiction over wholesale power transactions in national energy legislation. State regulators said holding company and Federal Power Act revisions attempt to create a national electric marketplace by increasing federally regulated wholesale transactions. NARUC argued that because most wholesale transactions actually will occur within a state or regionally, state commissions, not the Federal Energy Regulatory Commission, should regulate them.
- Legislation to remove the Office of Civilian Radioactive Waste Management from the federal budget process. Spending for OCRWM will exceed federal budget limits, but shouldn't be capped, said NARUC, because funds came from ratepayers, not taxpayers. Ratepayers paid $619 million into the fund in 1991 and a total of $8.4 billion to date.
- Expansion of funding for OCRWM over the $392 million slated in the fiscal-year 1993 budget if needed to continue work on high-level nuclear waste disposal projects without interruption. NARUC conditioned support for the increase on certain program improvements.
- Funding for the NARUC Nuclear Waste office to track the high-level nuclear-waste disposal program. Regulators have voluntarily funded the office for two years.
- Continued research and development of electric vehicles.
- Utilities' use of photovoltaic (PV) technology; including PV in integrated resource plans when cost-effective.
- The Environmental Protection Agency's Green Lights Program. Regulators said support didn't presume cost recovery for utility investment on Green Lights spending, but still encouraged commissions to promote the program.
- Added federal funding for the Low Income Home Energy Assistance Program (LIHEAP) and Weatherization Assistance Program (WAP).

Clean Air Act guidelines

NARUC also:

- Urged Congress to fairly collect fees for decommissioning and decontamination of uranium-enrichment facilities. NARUC and other industry groups oppose a proposed 0.33-mil per kilowatt-hour fee for all U.S. nuclear power production (*EL&P*, 2/92, p.1) based on 50 percent of expected cleanup costs.

U.S. utilities have purchased just 30 percent of these services, said NARUC. The method doesn't reflect the amount of services used in the past, or use by the Dept. of Defense and foreign DOE customers, regulators noted.

- Supported stable, long-term policy providing tax incentives for solar, wind, geothermal and biomass technologies.

New nuclear siting rules to be tested

WASHINGTON—Three utilities, industry groups and the federal government agreed to test new siting procedures for standardized nuclear reactors.

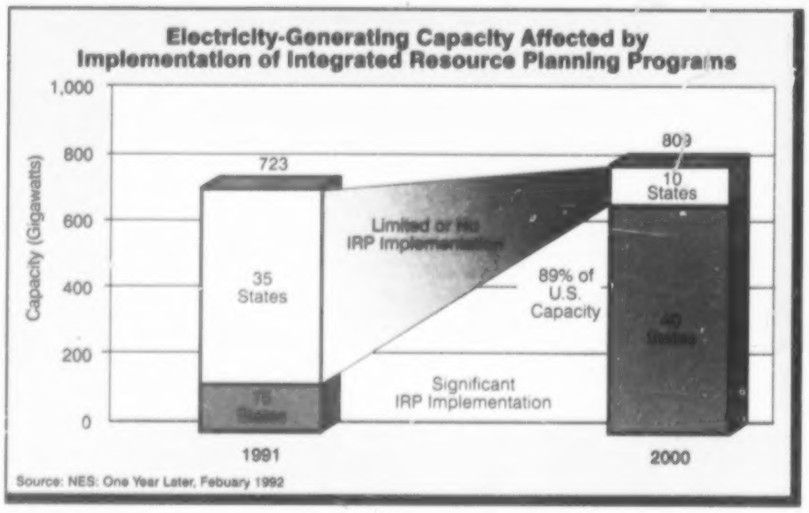
The nuclear energy industry also agree to commit $100 million to match federal funding for completing advanced light-water reactor designs.

The industry called the siting measure an "important step forward," which should culminate with the Nuclear Regulatory Commission issuing an early site permit by the end of 1995, said the U.S. Council for Energy Awareness.

Involved in the effort are the Department of Energy, Electric Power Research Institute, Nuclear Management and Resources Council and subsidiaries of Commonwealth Edison, The Southern Co., and Public Service Electric and Gas. DOE and the industry are splitting the $20 million cost.

On the ALWR design effort, an association of utilities called Advanced Reactor Corp., will split the $200 million in costs with DOE to complete both a passive and active design by 1995.

A broad industry commitment exists "to create the conditions under which the nation's utilities can order standardized advanced nuclear plants by the mid-1990s," said Sherwood Smith, chairman and president of Carolina Power & Light and chairman of the Nuclear Power Oversight Committee. He made the comments to Congress.



Source: NES: One Year Later, Febuary 1992

National Energy Strategy: 1-year progress updated

WASHINGTON—Progress of the Bush Administration's National Energy Strategy was updated in a "One Year Later" report. Congress had failed to produce a final energy policy bill at the time of the report's release.

Ninety initiatives in NES do not require legislation. (See also *EL&P*, 1/92, p.8.)

Among key achievements, released in the administration's report, were:

- An executive order to cut energy consumption in federal buildings by 20 percent by the year 2000.
- Department of Energy rules on lighting and appliance efficiency.
- Higher funding for conservation and electric and hybrid vehicle research and development.
- A U.S. advanced battery consortium, a four-year, $260-million effort.
- An Internal Revenue Service clarification of tax treatment for efficiency incentives.
- Streamlined hydropower licensing, and proposed natural gas pipeline regulation reform.
- Transmission-access policy via Federal Energy Regulatory Commission decisions.
- Increased integrated resource planning (IRP) efforts at federal power marketing administrations. (See graphic for overall increase in IRP programs.)

Power still flows in oldest U.S. transmission lines

BUTTE, MT—Montana Power Co. might have the world's oldest transmission lines still in service. The Missouri River lines A and B were installed between 1900 and 1902 to carry power from the old Canyon Ferry power plant at Helena to Butte—a distance of 63 miles.

The lines were built with western red cedar poles and have almost 95 percent of the original poles still standing.

Ed Hildreth, purchasing agent, Montana Power, says that the power transmitted over these lines originally was used for the operation of the Colorado Smelter just east of Butte and for the mammoth 900 hp compressor at the Anaconda Mine.

According to Hildreth, these two lines were probably the first real transmission lines in America and possibly the world. For a time, they were the world's highest-rated voltage lines at 60 kV. Presently, the lines operate at 69 kV.

A 1965 inspection report on the A line states that when the original lines were constructed through the wilderness between Boulder and Butte, a wagon road was cut through the timber and into a mountainside, necessitating the dynamiting and moving of large quantities of rock.

Where the lines crossed a swampy area at the 7000 ft. level, a one-mile long roadway was constructed. Large poles were laid in the swamp, then small poles acting as stringers were laid across these poles, and 3-inch saplings laid crossways to the stringers to form the roadway's deck. The roadway is discernable today but not usable.

Two major programs

There were two major stubbing programs in 1924-25 and again in 1941 and 1945. The stubs used in 1924-25 were heavily creosoted, the majority of which were found to be "as sound as the day they were installed."

Between 1928 and 1932, arsenic-treated stubs were used and "the majority of these indicate a definite need for repair." The report says that "it should be noted that many of the original poles still stand unstubbed and are suitable for many additional years of use."

A 1988 inspection showed that of the 1430 original western red cedar poles, 1355 are still in service, with 779 having been stubbed for continued use. Hildreth says, "That is an impressive performance by anyone's standard."

Cross section of this 90-yr-old cedar pole shows the effects of weather cracking but no decay.

Two 60-kV lines built in 1900-1902 are still operating with almost 95 percent of the original poles still standing. Only about five percent have been stubbed to prolong their life. Photos courtesy of Montana Power Co./Western Red Cedar Association.

COMMENTARY

Utilities and the elements

There will be a United Nations conference in June that is intended to produce a world treaty on global warming. There will be intense pressure to produce a treaty that calls for national carbon dioxide emission caps and, possibly, emission reductions. Many industrialized nations have already endorsed such a policy. The U.S. has not—yet—but the pressure is building. Global warming has become one of the key issues in the presidential election campaign.

The effects of a restriction on carbon dioxide emissions on the utility industry would be immense. Concern about this issue is already having an impact: several states are imposing carbon-dioxide emission penalties on fossil-fired generation options in their least-cost-planning exercises.

Global warming is just one example of the dominant role played by environmental issues in our industry. This month we begin a series of special reports on electric utilities' interaction with the environment. This month we explore utilities and water. In August the subject will be air, and next February it will be the land.

Utility operations have an obvious impact on the elements—the physical environment—and the elements, conversely, play an integral role in the production and delivery of electricity. The political sensitivity of that interdependence call for careful handling.

Environmental concerns are not limited to global issues. They are not even limited to national issues, although the 1990 Clean Air Act Amendments' national acid rain regulations are changing the way utilities think about plant operations. Local, grassroots environmental issues are becoming at least as important as the big ones. In fact, for siting new plants, local issues tend to be the most important.

For example, local concerns over steam plant impact on waterways has led to widespread adoption of dry condenser cooling technology over the past five years. This is a significant development in power plant technology that is not mandated by any federal or state law. Several dozen non-utility power plants are now in operation or under construction with non-evaporative cooling systems due largely to local environmental concerns. The trend is expected to spread to larger utility-scale plants, as described in our water article this month.

Most of the environmental interdependence occurs on the power production side of the business, but power delivery is not immune. In fact, concern over the effects of electric and magnetic fields existing around electrical equipment—ranging from extra-high-voltage transmission lines down to household appliances—is rapidly becoming one of the most troublesome environmental issues. This one is particularly difficult to handle because regulation is beginning so far ahead of any technical definition of the problem that planners have no way to predict its ultimate impact.

Does all this mean it will be impossible to generate and transmit bulk electrical power in the future? I don't think so. It means it will be more difficult to get approval for new facilities. The new facilities will cost more than they have in the past.

However, the experience of non-utilities in recent years is instructive. They have flourished in this new environment, but they have paid a price. They've been forced to adopt new dry cooling methods, selective catalytic reduction systems for reducing nitrogen oxide emissions, and other costly and innovative cleanup technologies. But they've been able to site hundreds of new power plants, many of them much closer to populated areas than utility plants are typically located. They've shown that it can be done.

Dealing with environmental issues in the 1990s poses a challenge, but it's a challenge that we can meet.

Robert Smock, Editorial Director

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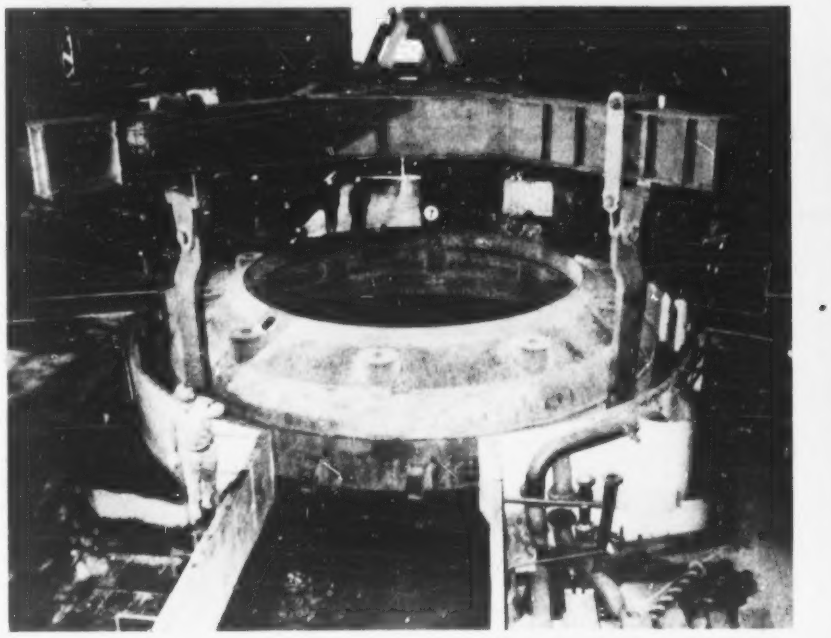
Construction of second GE advanced design nuclear reactor starts in Japan



Construction of the second advanced design nuclear power plant has begun in Japan at Tokyo Electric Power Co.'s Kashiwazaki-Kariwa site northwest of Tokyo. Work was started on the first unit in September 1991. General Electric Nuclear Energy is providing the reactors, nuclear fuel and turbine generators for the $1.4-billion project. Shown above is a massive forging for the bottom head, internal pump region of the reactor vessel for one of the advanced boiling water reactors. When completed, the station will output a total of approximately 8.2 million kW, according to GE.

NEWS BRIEFS

JILL MINNER, Assistant Editor

Drought hurts outlook for hydro generation

Both Idaho Power and Bonneville Power Administration predict that poor hydroelectric generating conditions during the first quarter of 1992 will continue throughout the year. Light precipitation, low reservoir levels, and new flow requirements for salmon have contributed to the worsening outlook. BPA said it has already spent almost $40 million to purchase power from other sources, and Idaho Power has put a transmission project on hold for at least a year to contain costs.

Business briefs

Houston Lighting & Power Co. has contracted with **Ebasco Constructors Inc.** for the turnkey construction of HL&P's first combustion-turbine cogeneration project. Ebasco said it will provide engineering, design, procurement, construction, startup and performance testing services for the 160-MW plant which will be located in LaPorte, TX. The project is scheduled to be finished by January 1995, according to Ebasco.

Cypress Energy Partners, a joint venture between **NRG Energy Inc.** and **Black & Veatch Power Development Corp.**, has agreed to develop, construct and operate a coal-fired power plant near West Palm Beach, FL, and sell the power to **Florida Power and Light Co.** Construction of the two-unit, 800-MW plant is scheduled to begin by early 1994, with service expected by 1997-98. Independent power producer NRG is an affiliate of Northern States Power Co.

TransAlta Resources Investment Corp. and **Alberta Natural Gas Co. Ltd,** participants in a joint venture cogeneration project in British Columbia, have signed a letter of intent with the **Sacramento Municipal Utility District** to negotiate a long-term power sales contract. The joint venture said its proposed cogeneration plant would supply SMUD with 130 MW for 30 years beginning in January 1996. Construction of the proposed $150-million facility would begin in the second quarter of 1994, according to TransAlta.

Siemens AG and **United Technologies Corp.** (UTC) have signed an agreement which gives Siemens continuing access to aircraft-derivative gas-turbine components technology developed by UTC's Pratt & Whitney (P&W) division. The agreement expands a 1988 alliance in which a unit of P&W and Siemens Power Generation Group (KWU) cooperated in the advancement of components that could be used in Siemens' next generation of large industrial gas turbines.

GE Power Generation will supply up to 15 gas-turbine generators to **The Southern Company**, owner of Alabama Power, Georgia Power, Mississippi Power, Gulf Power and Savannah Electric. GE said the contract commits The Southern Company to purchase at least six units which are expected to begin commercial operation in 1995 and 1996.

Public Service Electric and Gas Co. has ordered four gas turbine-generators for its Bergen Generating Station from **Siemens Power Corp.** The utility is repowering its facility in two phases, the first to be completed in 1995. PSE&G has an option to purchase four additional units for the second phase, scheduled for service in 1998, according to Siemens.

Commonwealth Edison Co. has chosen the **Atlantic Group** to perform motor-operated valve overhauls at the Zion Nuclear Power Station. Under the contract, Atlantic will provide quality control, labor, supervision, tooling, and equipment during two scheduled refueling outages in 1992.

Fluidized-bed uses and sizes to grow, says survey

LILBURN, GA—A panel formed to survey use of fluidized-bed boilers (FBBs) in the United States and Canada listed the most important recent advances in the field. The panel from top vendors to the field said the advances were pressurized FBC (fluidized-bed combustion), reheat applications, 150-MW and larger FBB sizes, SO_2 and NOx control, move towards circulating beds, better control of size and consistency of fuel leading to more predictable performance, scale-up knowledge, and experience with a broader range of fuels.

The most important user trends the panel named were larger sizes of FBBs, burning of refuse and other difficult fuels, use of waste-coal-based fuels, larger-sized units, and purchases of FBBs by utilities.

The survey, published in 1991, went beyond its stated limited purpose to cover only the U.S. and estimated the worldwide market for FBBs as worth $360 million in 1990, with $250 million in the U.S. alone. It also estimated the world market would grow to $800 million in 1995, with the U.S. portion at $500 million.

This forecast was equivalent to a 15-percent average annual growth rate in the U.S. and a 19-percent average annual growth rate worldwide during the period 1990-95.

These rates were estimated for 25 units worldwide in '90 and 50 in '95, with 12 in '90 sold in the U.S. and 25 sold in '95.

Unit sizes were noted as moving from 85-percent small (100-200 MW) and 15-percent medium-sized (200-1000 MW) in '90 to the '91 makeup of 70-percent small and 30-percent medium-sized.

The panel listed the U.S. FBB market leaders, in order, as Pyropower, ABB, Combustion Engineering, and Foster Wheeler, who together had 74 percent of the sales. But the panel also said these leaders' share would drop to 69 percent in 1993.

The panel of nine members affiliated with companies that develop, manufacture, and/or sell FBB products consisted of one company vice president, three engineering managers, three marketing managers, and two others.

The small size of the panel was justified by the survey taker, Future Technology Surveys Inc., on the basis that individuals affiliated with companies involved in a specific field of technology are considered a "homogeneous population." Therefore, the reasoning goes, within such a homogeneous group, a sample size of 5-10 generally is sufficient to provide accurate results for a survey.

Utilities get 58% of rate hikes they seek

WASHINGTON—To get a rate hike the size it really wants, a utility should ask for an increase 71 percent larger than that amount.

Over the period 1981-1990, investor-owned utilities received $42.18 billion, after filing for $72.13 billion in rate increases, according to recent statistics from the Edison Electric Institute. (See table.)

Utilities received an average of 58.5 percent of the amount they sought during that period. For each five-year period, the averages approved as a percentage filed were nearly identical.

Rate Increases Filed and Approved 1981-1990, Investor-Owned Utilities ($ Millions)

Year	Filed	Approved	Approved as % of Filed
1981	$11,902	$8,341	70.1
1982	11,923	7,629	64.0
1983	12,783	5,373	42.0
1984	7,524	4,745	63.1
1985	8,310	4,687	56.4
1986	3,758	2,881	76.7
1987	5,327	2,304	43.3
1988	2,679	2,099	78.4
1989	3,778	1,855	49.1
1990	4,146	2,266	54.7
1981-90	**72,130**	**42,180**	**58.5**

Source: Edison Electric Institute, EL&P

from page 13

Managing change...

ment over control. That model should emphasize that:

1) Control and coordination of work are based on shared organizational goals and expertise.

2) Management acknowledges legitimate claims of multiple stakeholders.

3) Gaining people's commitment will lead to enhanced performance.

4) People are seen as appreciating assets.

5) Work is being designed to emphasize the whole task, instead of separating thinking from doing.

6) Adaptability and ingenuity are considered desirable on-the-job qualities.

7) Shared goals and traditions are taking precedence over rules and procedures as ways of gaining commitment.

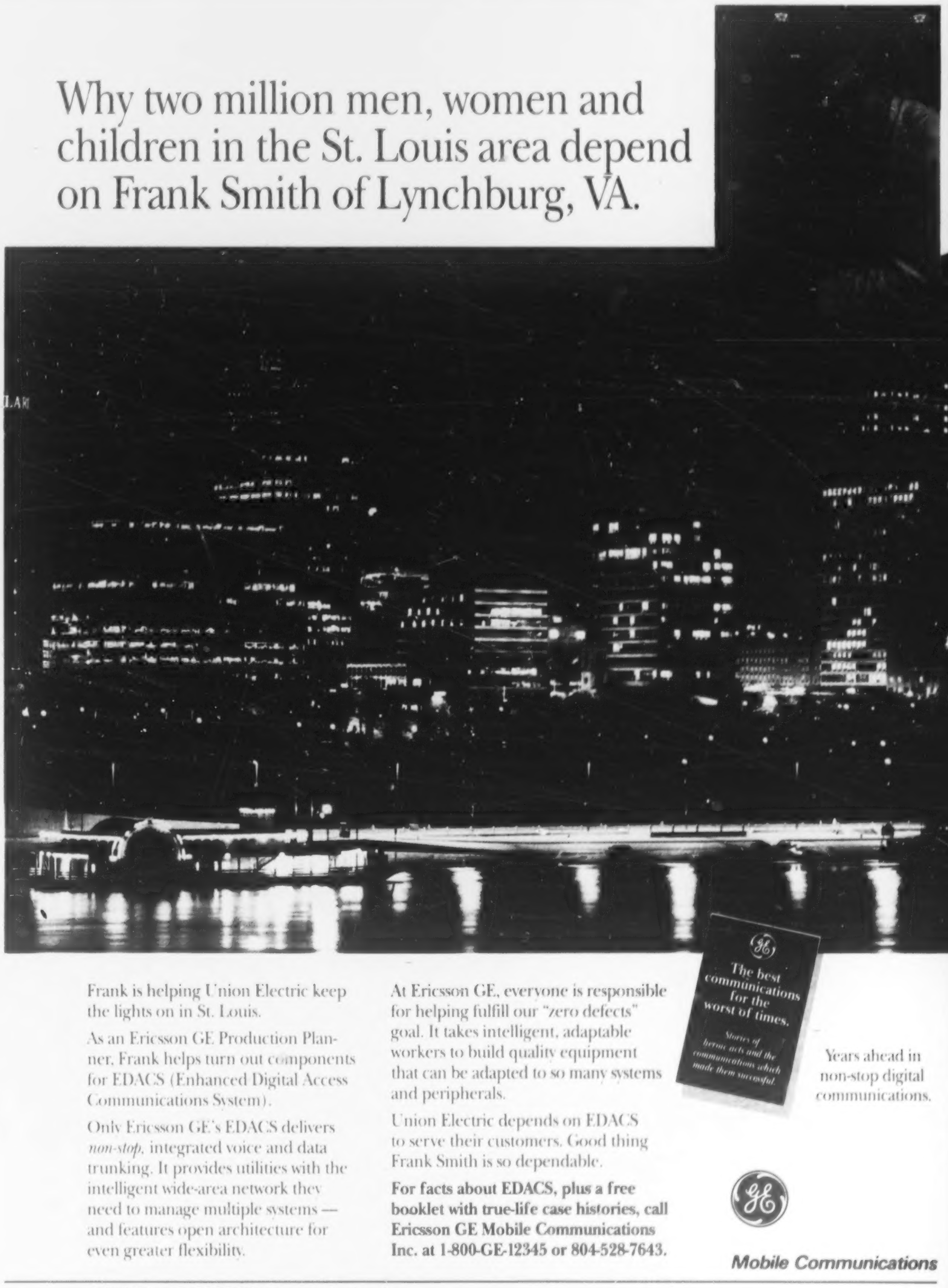
8) Bureaucratic structures are being flattened and more people are taking on the problem-solving responsibilities of management.

9) Rewards are being based more on mastery of skills and on group-oriented performance than on "Lone Ranger" grandstanding.

10) Greater effort is being made to give employment assurances.

11) Training and retraining are becoming major avenues to support the transition into this new model.

12) The "enemy within" viewpoint is being exchanged for one that views true competition as existing outside the organization.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ComEd, Consumers Power convert four units to natural gas

Commonwealth Edison Co. and Consumers Power Co. are converting generating stations from fuel oil to natural gas *and* fuel oil to save money.

At Commonwealth Edison

ComEd's Collins Generating Station, located near Morris, IL, has five equally sized units capable of producing 2794 MW gross units and is the company's only oil-fired steam plant. By converting three of the units to natural gas/oil, the utility expects to spend \$20-25 million and, depending on the costs of gas vs. oil, to break even on fuel costs or save up to \$70 million per year. Savings will be automatically passed on to customers through the fuel clause in their electric bills. The conversions are due to be completed by mid-1993.

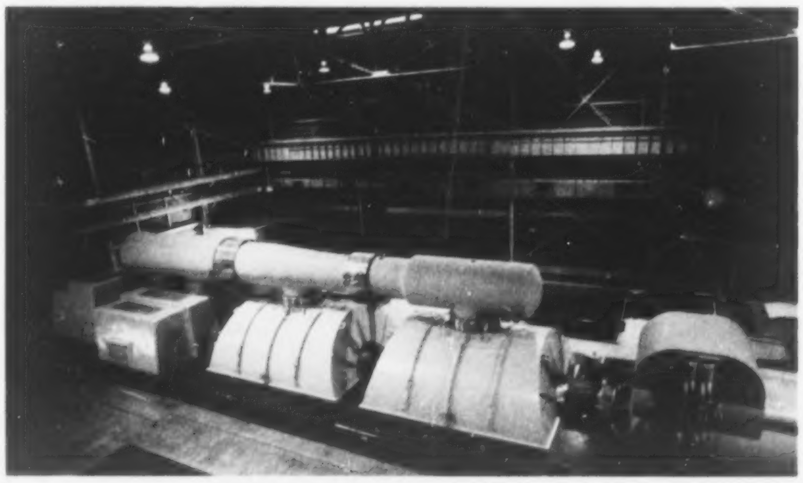
To provide for the fuel supply, the Illinois Commerce Commission approved a 10-year contract between ComEd and Northern Illinois Gas. By terms of the contract, ComEd will have the option of using whichever fuel offers a cost advantage at any one time.

According to Jim Benetucci, conversion project engineer, the station will be able to change the three units from one fuel to the other in 20 min to an hour.

The new components that allow for this changeover include 24 low-NOx burners per furnace that will burn the natural gas or No. 6 fuel oil, a burner management system integrated with the existing boiler controls, and a 24-in.-diam gas pipeline into the facility. The pipeline will operate at 500-700 psig to carry a maximum of 5-million scfm of natural gas into the plant.

The other two oil-burning units are not being converted for natural gas usage. They were built so they could be quickly retrofitted to be capable of burning oil or coal. Edison officials consider this an important advantage in today's rapidly changing fuel market.

ComEd's Collins Generating Station (top) is converting Units 2 and 3 in the foreground, and Unit 1, to burn both natural gas and oil. Consumers Power, meanwhile, is doing the same for Unit 4 at its Dan E. Karn plant (bottom).



At Consumers Power

Consumers is converting oil-fired Unit 4 at its Dan E. Karn generating station near Essexville, MI, so it, too, can burn either oil or natural gas. Plans call for the unit to operate on natural gas primarily in the summer when customer demand is high and gas supplies are less expensive and more abundant. The rest of the time, it will burn oil.

The 88-million project cost is split, with \$7 million just for engineering and installing the burners, and \$1 million for additions and modifications for handling the natural gas.

The changes to the unit include: replacing 16 of the current burners with low-emitting gas/oil burners; replacing oil ignitors with gas ignitors; installing a 16-in. gas supply line on each side of the boiler and 10-in. headers across each burner deck; and putting in new controls and valving.

At maximum capacity, the unit will consume 4.3-million ft^3/hr of gas to generate approximately 425 MW. When operated with both gas and oil simultaneously, it can produce 638 MW.

Notes Kurt Rudolph, senior engineer at Karn, the oil gun will be in the middle of each burner, with gas injectors located in a circle around it. Of the unit's 30 burners, 16 will be replaced with combined oil-gas types. The rest will be left as is, unless the utility can get a larger gas supply. In that case, they, too, will be converted to dual-fuel burners.

As with ComEd, Consumers will have to change the burner management system to accommodate the dual firing. However, unlike Edison's work, Rudolph says Consumers will also change the data acquisition and combustion control systems. The work should be completed by May of 1993.

Nuclear industry responds to maintenance rule

Henry Stein
Senior Editor-Power Production

MIAMI—The nuclear industry's response to the new maintenance rule is an example of the licensees' new approach to regulatory relations, according to Ron Simard, director of industry relations for the Nuclear Management & Resources Council, a nuclear utility organization. Speaking at the first EPRI Plant Performance Seminar here Feb. 24-25, he said that industry representatives are increasingly developing guidelines and procedures for the entire industry and submitting the ideas to the Nuclear Regulatory Commission for approval and agreement.

Maintenance rule

Simard spent some time discussing NRC's Maintenance Rule 10 CFR Part 65 that, he said, is broadly worded. It requires the industry to set performance goals for certain structures, systems, and components; to monitor the performance against those goals; and to assess the effectiveness of the maintenance. The intent is to place the burden on industry to develop the detailed implementation guidance—how goals and effectiveness are going to be set.

The implementation guide is scheduled to come out in July '93 and the rule is to be implemented in July '96.

Thomas Foley, senior engineer, Nuclear Applications Branch, NRC, backed up Simard's remarks by stating that the commission now is working closely with NUMARC in developing results-oriented regulation.

He suggested NRC was seeking close cooperation with the industry in performing and evaluating maintenance at generating plants, rather than continuing what has had all the earmarks of an adversarial relationship.

Foley declared that the industry performance groups were going to be vital to the success of the ideas put forth in NRC's draft memorandum titled "Transmittal of Unreviewed Draft of Regulatory Guide to Implement the Maintenance Rule (10 CFR 50.65)." It proposes new methods of "results-oriented assessments of maintenance effectiveness" to be made by nuclear plant operators.

Simard also noted that for every outage that begins after Jan. 1, 1993, the planning and control will be assessed by the industry-set guidelines.

Another, more recent example he gave was access authorization. Industry took the intitiative to determine the associated costs, and decided it could set guidelines that would improve the efficiency and save money when exchanging data and allowing workers or inspectors into the plants.

In another instance, a proposed rule on diesel engine reliability became performance-based.

Simard noted there were 33 utilities and 75 people directly involved in the industry working groups and committees promulgating the guidelines. And eight utilities had agreed to take the draft guidelines to their plants to see if they work—Simard called it "V&V," or "verify and validate."

The NRC has gone along in two ways. First, the commission has asked for industry comments in the *Federal Register* on several areas where it thinks it can relax requirements without impacting safety. Second, the NRC has asked for comments on where it can become less prescriptive through regulations and make them more performance-based.

Simard said another *Federal Register* notice was due to come out Feb. 25, asking for ideas from outside the commission on where to reduce the number of its rules and regulations.

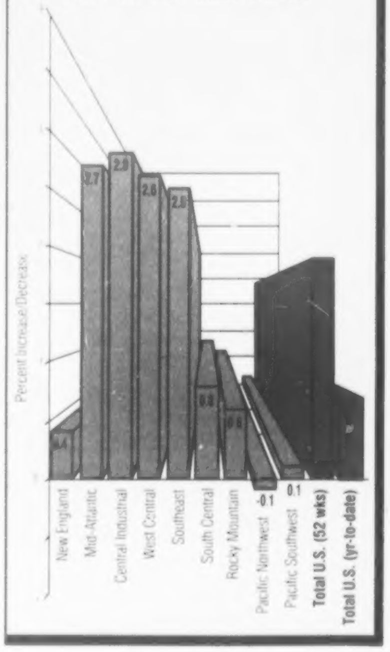
Where it began

The NRC made a survey two years ago and summarized what it heard in NUREG Report 13-95. It found NRC dominated licensee detailed work and licensees acquiesced to this domination. As a consequence of the survey, the commission intiated improvements in its methods of operating.

For instance, before issuing any new generic communication, the NRC staff must now apprise the commission of the safety issue involved and must solicit industry input.

ELECTRIC OUTPUT
Growth Went Up

Changes in net electric output from the Mainland U.S. electric utilities continued to vary widely for the 52 weeks ending Feb. 26, as reported by Edison Electric Institute. Variations in weather in the country were considered the main reasons.



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LATE NEWS

EEI, NRECA, APPA, and dozens of utilities threatened legal action to get EPA to comply with a 1980 law and decide if coal ash produced by utilities needs to be regulated. A 1988 EPA report called practices safe, but without formal guidance, uncertainty remains.

Western Resources (WR) will be the new name for Kansas Power & Light Co., pending approval. KPL acquired Kansas Gas & Electric in a $1-billion deal made final on April 1. KPL would become a division; KG&E, a subsidiary, of WR.

Northeast states plan NOx rules

Mark T. Hoske
News Editor

Regulators in the Northeast hope to devise regional guidelines for utility plant nitrogen-oxide emissions in eight states. The proposals would cut utility NOx by more than 50 percent for a May 31, 1995, deadline.

Affected utilities, which have had input in the process over the past year, seek more flexibility and system averaging before individual states make the guidelines into rules.

Final rules "will be subject to each state's regulatory adoption process and public comment process," the regional group said in a statement.

States must devise NOx guidelines to meet the Clean Air Act Amendments of 1990. States with ozone-non-attainment areas, including a large area of the Northeast, have more stringent compliance concerns and must submit plans to the Environmental Protection Agency by Nov. 15. States not complying face federal penalties.

Costs depend on situation

Compliance costs are uncertain and depend on utilities' present controls and generation mix. Better-than-expected results from the 1995 deadline could ease compliance for the second of two deadlines, May 15, 1999. Compliance standards are set by the EPA.

The regional approach might benefit utilities by consistent regulation.

> ***Combustion modifications will probably be enough for first-phase compliance, but more costly measures may be needed later.***

"The numbers are certainly pretty low, but are intended to be achievable using only combustion modifications for the first phase," said Charles Carlin Jr., Northeast Utilities senior engineer in environmental compliance.

Second phase

The second phase, might require add-on controls, Carlin said, and could be considerably more costly.

The group, Northeast States for Coordinated Air Use Management (NESCAUM), consists of air regulators from Connecticut, Maine, Massachusetts, New Jersey, New Hampshire, New York, Rhode Island, and Vermont.

Reasonably available controls

The NESCAUM strategy meets the utility boiler "reasonably available control technology" (RACT) requirements, adopted in March by the 12 Ozone Transport Commission states. OTC includes NESCAUM states plus Delaware, Maryland, Pennsylvania, and Virginia, with Washington, DC. OTC is working regionally to cut smog and ground-level ozone. A recent National Academy of Sciences report recommended that NOx cuts are more important than cuts in hydrocarbons.

For some states in this region utilities generate more than 20 percent of total NOx. Mobile sources contribute 60 percent.

Proposed reductions would have to be approved in each state.

NU, would have low compliance costs compared to other utilities, an estimated $10 million for the first phase, Carlin said.

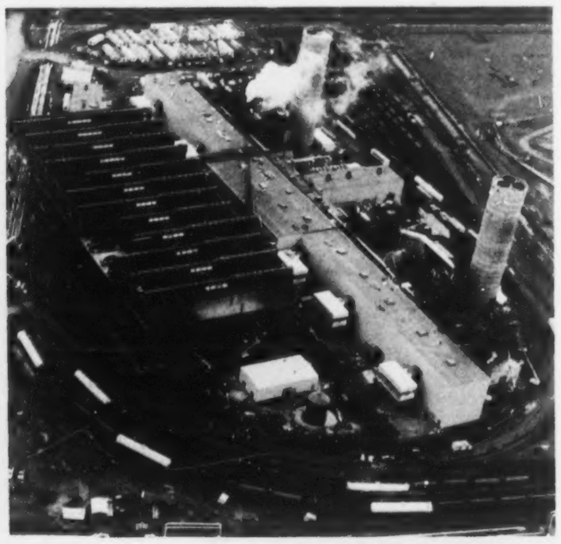
Also, Carlin pointed out, the final rules could cost less if they require compliance based on average annual emission measurements rather than continuous compliance.

Generation mix

Northeast Utilities generation mix includes 65 percent nuclear energy and 5-percent hydro. The rest is mostly oil, with one coal plant. NU already complies in Connecticut.

Biggest NUG opens in June

LINDEN, NJ—The Linden Cogeneration plant, opening in June, "is the largest non-utility owned power plant in the country," according to developer, owner, and operator, Cogen Technologies.



The $500-million, 614-MW turbine plant will also produce up to 1-million lb steam for Exxon. Consolidated Edison Co. signed a 25-year contract to buy electricity.

Project Manager Ragan Phillips, a Cogen Technologies vice president, told *EL&P* the plant would come in under budget and might start by late May.

The five-unit, natural-gas-fired combined-cycle plant uses General Electric Co. gas turbines, and steam turbines.

To operate the plant, Cogen Technologies hired North American Energy Services, a venture of Pacificorp, Puget Sound Power & Light, Washington Water Power, and Portland General Electric Co.

Linden will be among the largest U.S. generating plants with a dry cooling system (*EL&P*, 4/92, p.23).

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Transmission-access mandates will kill reliability, says NERC

PRINCETON, NJ—"Mandated transmission services could prove fatal to the standards of reliability the public deserves and expects," said the chairman of the North American Reliability Council in its 1991 annual report, released in March.

Earl Dille, NERC chairman, questioned if Congress really understood how the electric system works. Today's reliability depends on "close coordination among utilities in planning and operating," he noted.

Dille lamented, "Unfortunately, most of the legislative ideas being developed seem to ignore the benefits of increased coordination."

Owners should be compensated

If legislation mandates transmission use, facility owners should be fully compensated for all economic losses associated with the transaction, NERC noted. "Anything short of that penalizes the native-load customers who have footed the bill for the facilities in the first place," Dille said.

"Some proposed legislation gives FERC authority to decide whether certain purchases and sales could take place. NERC believes the utilities, which have the ultimate responsibility for operating electric systems and reliably supplying their customers, should make these decisions," the annual report noted.

Despite these comments, NERC President Michehl Gent said NERC is "neither for nor against" any of the legislative proposals. NERC staff has spent hundreds of hours explaining the electric grid and differences to the phone system to Congress, Federal Energy Regulatory Commission, National Energy Board, Department of Energy, and utilities, Gent said.

A NERC "white paper" will make specific comments on various legislative proposals that will impact reliability.

Violations, reports, expansion

Other portions of NERC's 65-page annual report look back at major reliability topics of 1991 and ahead to future challenges.

Some key items include the following.

- NERC's Operating Committee predicted "interesting" discussions this year due to unintended violations in operating guidelines at several control centers. One 100,000 MWh of inadvertent Eastern Interconnection interchange during July-August "raised the ire of utilities from Florida to New England," the report said.
- "Impact of FGD Systems" is one of several generating unit reports by the NERC Engineering Committee, covering availability, maintenance and operations.
- A spare transformer database update was completed in December.
- Other studies on forecasting accuracy, voltage instability, voltage collapse, are being prepared. Electric Power Research Institute and NERC are studying and will report on an Eastern Interconnection frequency drop.
- NERC's Monitoring Working Group expanded its size. It conducts confidential assessments of a generating utility's control center operations and is working on ways for utilities to perform self reviews.
- NERC's Generating Availability Data System information completed its first phase of data switchover, from mainframe to PC applications, for information from the 1960s to 1991.
- Utilities asked for more than 70 percent of over 200 special data-retrieval studies conducted.
- Highlights from within 10 NERC regions are also featured.

WPPSS, GE settle Plant 2 reactor containment suit

RICHLAND, WA—Washington Public Power Supply System and General Electric Co. settled seven years of litigation involving modifications to the Plant 2 reactor containment system.

WPPSS had alleged that GE knew one portion of the boiling water reactor containment design was defective.

While full terms were undisclosed, the March 24 settlement requires that GE provide some goods and services free and at "substantial discounts," not including nuclear fuel, according to a WPPSS release.

Modifications will increase output at the 1100-MW unit by 50 MW and "significantly improve" operation and reliability. A mediator helped with the settlement. A 1990 trial was declared a mistrial after a jury wasn't able to reach a unanimous verdict.

GE previously settled similar suits with Pennsylvania Power & Light and Long Island Lighting Co.

WPPSS and GE settle the Plant 2 suit on nuclear reactor containment. Full terms were undisclosed.

Incentive regulation would help establish new plant technologies

WASHINGTON—Incentive regulation could offset risks to help utilities try efficient new generating technologies.

Karl McDermott, for Argonne National Laboratory, encouraged regulators to devise regulatory incentives that would encourage clean-coal technologies.

McDermott, president of the Center for Regulatory Studies, based in Normal, IL, told state regulators that a disincentive exists for utilities to try newer technologies, such as those for clean coal.

Regulators should help by offsetting risks for new technologies and design incentives to help control project costs, he said, but not overly penalize for overruns beyond utilities' control.

4-5 plants required

Four or five plants must be built of a certain technology before the risk approaches that of established designs, he said. Until then, McDermott reasoned, regulators should encourage investment in these plants for the long-term environmental and cost benefits they will provide ratepayers. "In the short-term, there will be higher costs and rates," he said.

Cost savings can be dramatic. In one example, he compared a 500-MW pulverized coal plant with a flue-gas desulfurization scrubber to a pressurized fluidized bed coal unit. Although some costs for the conventional unit were much less, overall costs for the first year were $674.4 million for the PFB and compared to $832.1 million for the established technology.

Penalties, too, would be fair

A graduated reward and penalty rate of return for new technology plants would be one incentive regulators could use, McDermott explained. Incentives could also promote standard construction or utilities' use of independent power producers.

"You have to lower the hurdle first for utilities to take the risk," McDermott concluded.

EEI, NRECA expand ad program

WASHINGTON—Two utility trade associations will expand a new print advertising campaign in June, "Electricity. Taking You Into the Future."

The $1-million program started in March. The focus is electricity's growing share of total energy use, and environmental benefits of electric technologies.

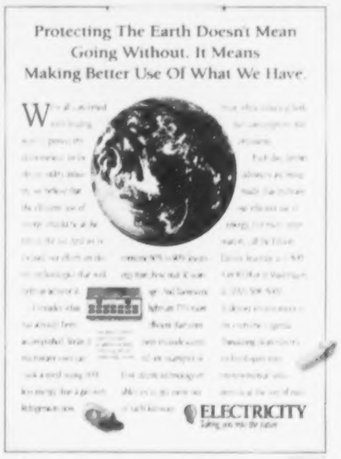
Fifteen ads

Fifteen color ads are planned, first to opinion leaders, then to general consumers, builders and industrial specifiers (see reduced advertisement).

The campaign, expected to run through year-end, is sponsored by members of the Edison Electric Institute and the National Rural Electric Cooperative Association. EEI and NRECA members generate and distribute more than 86 percent of U.S. electricity.

National backdrop

"The campaign also serves as a national backdrop to the efforts of utilities promoting electric energy efficiency locally to their customers," said EEI President Thomas Kuhn in a release.



Protecting The Earth Doesn't Mean Going Without. It Means Making Better Use Of What We Have.

ELECTRICITY

Taking you into the future

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Utilities improve in solar and wind power, but could expand

WASHINGTON—Two representatives for the renewable energy industry reported utilities' progress to state regulators at the Winter Meeting of the National Association of Regulatory Utility Commissioners. Both suggested that utilities' cost-effective investments in solar and wind applications could expand.

Edgar DeMeo, Electric Power Research Institute program director, updated progress on wind power, saying that utilities and vendors have taken great strides since the early 1980s. Wind now supplies more than 1600 MW in the U.S. without tax credits since 1986, DeMeo noted. Utilities or independent power producers installing today's turbines can anticipate capacity factors of 30-35 percent.

Wind power price

Wind power has dropped in price to $1000-$1200/kW, or 7-9 cents per kilowatthour. To compare, solar photovoltaics (PV) cost about $8000/kW, DeMeo said, appropriate only for certain site-specific applications. Previously reported efforts by U.S. Windpower, EPRI, and the Department of Energy on a variable-speed turbine expect to produce a wind turbine capable of 5¢/kWh energy. By May, 22 of these demonstration units will be in place, DeMeo said.

Lower price, higher reliability and many available sites mean that wind turbines should be used more widely, he said.

Expansion outside California

While California holds the majority of present wind development, it has among the lowest potential of Western and Great Plains states, DeMeo said. North Dakota alone has enough good wind sites to provide 36 percent of the 1990 electricity consumption for the lower 48 states, he said. Very high potential is also shown for South Dakota, at 24 percent. Wyoming, Montana, Minnesota, Kansas, Texas, Oklahoma and Colorado all scored 9 percent or higher, according to the EPRI numbers.

Wind-turbine installations use just 3-4 percent of the land they are sited on and often provide farmers with more from royalties than farming leased areas, DeMeo said.

The Utility Wind Interest Group, with 10 members, provides information about wind technologies to help utilities, he added.

Improve taxes on photovoltaics

Richard Sellars, director of technical services, Solar Energy Industry Association, noted that as early as 1998 some utilities would be using PV installations of 0.5-1 MW at substations as a cost-effective way to put off extensive substation redesign. Pacific Gas and Electric Co. anticipates using 30-40 MW of photovoltaics as cost-effective options by 1998, Sellars said.

Serving loads distant from existing distribution has become practical, especially in Mexico and on islands. As use grows, the price will fall.

Sellars complained that tax regulations don't place PVs on an equal field with other generating sources. The tax burden for PVs are two-to-six times as much per kilowatthour when compared to conventional fuels. While PVs have much higher capital costs, operation and maintenance amount to just 0.5 percent per year of conventional generation, he said.

Regulators could help by modifying integrated resource planning guidelines to account for high capital costs and reflect other PV benefits, Sellars recommended.

Wisc. EMF update: building ban fails

MADISON, WI—Wisconsin legislation that threatened to restrict transmission construction (*EL&P*, 2/92, p.3) died in committee. Amendments had reduced the bill to a survey to locate lines near schools, hospitals, housing for the elderly, and daycare centers.

The original bill would have banned all new construction of lines 69-kV and larger for three years because of the uncertain health effects of electric and magnetic fields (EMF).

Non-utility power, clean-air costs threaten some credit ratings

NEW YORK—Reliance on non-utility generation (NUG), and clean-air construction were among factors negatively affecting some credit-rating outlooks, according to a recent Standard & Poor's report.

However, generation construction also can negatively influence ratings—depending on the utility, regulators, and factors related to financial health and risk. S&P also cited too large a percentage of nuclear generation as a risk.

A factor limiting improvements in S&P ratings, or causing negative outlooks, was risk of significant costs related to compliance with the Clean Air Act Amendments of 1990 (CAAA).

Positive outlooks were linked to improving financial situations from completed construction and favorable rate recovery, cuts in operating and maintenance costs, and strong, sustained nuclear-plant operations.

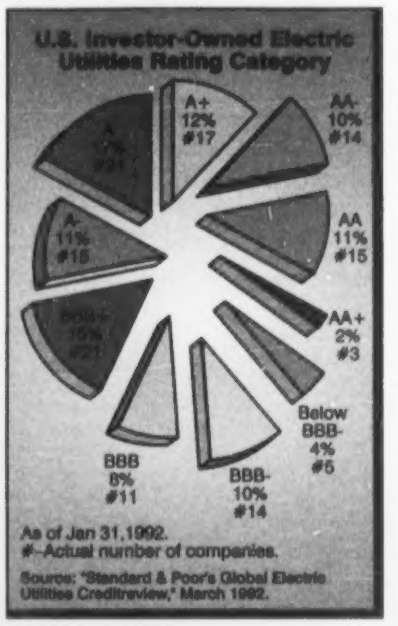
Six U.S. investor-owned utilities have positive rating profiles, two were listed negative and 18 more were stable, in the March 16, "Global Electric Utilities," by Standard & Poor's Credit review (see chart).

Among seven of Canada's utilities, two listed negative, one developing, the others, stable. U.S. municipal utilities and other non-U.S. utilities were also listed in the report.

Financial risks and rewards

Highlights included the following.

- Detroit Edison Co. showed a positive outlook, with strong cash flow and willingness to reduce debt leverage despite expected rate cuts in 1993 and 1994.
- Niagara Mohawk Power Corp.'s outlook was positive, but fixed charges associated with increasing NUG electricity purchases could slow financial improvement. Earnings improved under regulatory incentives, cost cutting, and "sustained" improvement in nuclear performance.
- Despite risks associated with increased CAAA construction spending, Duke Power Co., Georgia Power Co., and Indiana Michigan Power Co. received stable outlooks.
- For PacifiCorp, credit concerns were expressed for "management's zeal in pursuit of expansion," despite a recent Arizona Public Service deal "enhancing" the long-term operating position. Ratings outlook was stable.
- Ohio Power Co. had a negative outlook with huge acid-rain compliance costs and industrial customers "hard pressed to absorb" those costs.
- Virginia Electric & Power Co. also had a negative outlook. Growth requires 5000 MW of capacity by 2000, 74 percent with contracted purchases from non-utility generators. Purchased power "does raise concerns associated with operating reliability," said S&P. Associated fixed charges from the long-term contracts results in higher rate needs, S&P added.



As of Jan 31,1992.
#-Actual number of companies.

Source: "Standard & Poor's Global Electric Utilities Creditreview," March 1992.

EPA's Green Lights efficiency program exceeds expectations

WASHINGTON—The U.S. Environmental Protection Agencies' Green Lights program celebrated its first birthday by exceeding expectations for progress.

The program allows companies to form voluntary alliances with EPA to analyze, install and promote profitable energy efficient lighting, using agency expertise to improve profitability and lighting quality.

Bob Horton, EPA program director, said more than 400 companies participated in the first year, twice the expected amount. Utilities, lighting and energy service companies, businesses, manufacturers, universities, and various units of government are among program participants. More than 33 utilities were involved as of March.

Program to grow 2-3 times faster

At the 400 companies, 77-million ft^2 has been targeted for relighting. At the end of the first year, about 20 percent of that area had been completed, yielding a 50-60 percent energy savings, about 53-million kWh, Horton said.

The EPA hopes to get 800-1200 more companies involved during 1992. In 1993, "We hope energy efficiency lighting will become the standard," Horton said.

Environmental benefits, if all U.S. companies made all profitable investments in lighting efficiency, would include a 10-percent, $20-billion reduction in electricity bills, with a 4-percent cut in nitrogen oxide, a 7-percent reduction in sulfur-dioxide and a 4 percent drop in carbon-dioxide emissions (see related table). The CO_2 cut represents one-third of U.S. auto emissions. Lighting comprises about 25 percent of U.S. electric demand.

In addition to profitability savings, program participants get objective reviews of available lighting technologies, cutting-edge software to analyze options and profitability, and a regularly updated database of financing sources, Horton explained.

Compares lighting to new plant

At the winter meeting of the National Association of Regulatory Utility Commissioners, several state regulators asked why EPA doesn't provide a figure showing simple payback on investment, rather than the more complex 20-year return on investment.

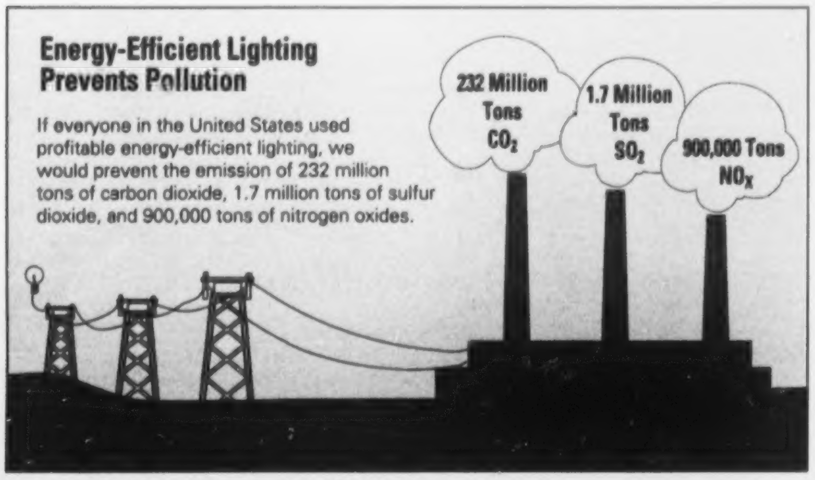
The more complex method, Horton said, considers factors that may be overlooked in a simplistic payback measure, such as relamping cycles and maintenance.

"We're trying to elevate payback in energy projects from a quick and dirty payback to thinking of it as they would as an investment in a new factory," Horton explained.

Most institutions use lowest first-cost lighting systems, rather than lowest life-cycle cost technologies, said EPA's "Green Lights Program: The First Year" report.

Horton also cautioned the stop-and-start nature of some utility and regulator-induced demand-side management programs. Huge swings in demand for products and services can hurt manufacturers and suppliers, Horton said.

Programs that only promote the most profitable investments for quick payback can damage future efforts, he added. NARUC endorsed the program with a resolution.



If everyone in the United States used profitable energy-efficient lighting, we would prevent the emission of 232 million tons of carbon dioxide, 1.7 million tons of sulfur dioxide, and 900,000 tons of nitrogen oxides.

Source: EPA's "Green Lights Program: The First Year"

IEEE cites EPRI managers for work

WASHINGTON—The Institute of Electrical and Electronics Engineers (IEEE) has elected two Electric Power Research Institute project managers as Fellows. Joseph Porter, switchgear research and development manager, has been cited by IEEE President Eric Sumner for his "contributions to circuit breaker technology."

Porter received an IEEE Prize Paper Award in 1990 describing the design and testing of the world's first high-voltage direct current circuit breaker. Porter has worked on research projects on overhead lines, distribution and transmission substations programs with primary focus on switchgear, power system transients, instrumentation and electromechanical devices related to high-voltage power transmission. He formerly worked for General Electric Co. as manager of the High Power Laboratory.

Bruce Bernstein was cited by Sumner for "pioneering research leading to the understanding of the aging phenomena of extruded-dielectric high-voltage power cables."

Focusing on technology that controls aging of underground cables, Bernstein questioned assumptions and implemented superior diagnostic techniques to study physical and chemical changes in polymers used in insulation of underground cables.

He currently manages projects for the Distribution and Underground Transmission Programs, and also guided research relating to polymeric materials, electrical insulation and cables for the Institutes's Office of Exploratory Research.

Joe Porter

Bruce Bernstein

Bernstein formerly worked as manager of Research and Development for the Facile Division of Sun Chemical Corp., Paterson, NJ, where he developed laminated composite materials to prevent moisture from entering power and communications cables.

While working as materials section manager at Phelps Dodge Cable and Wire Co., Yonkers, NY, Bernstein guided the first EPRI-sponsored research on water treeing in extruded cables.

DA/DSM Symposium call for papers issued

SAN FRANCISCO—In just two years, the International Symposium on Distribution Automation and Demand-Side Management (DA/DSM) has become a comprehensive forum in which industry leaders discuss these developing technologies and opportunities to defer major generation and power delivery expenditures. The Eureka Group is issuing a Call For Papers for the 3rd International Symposium to be held in Palm Springs, CA, Jan. 11-13, 1993. Papers are invited on these topics:

- Feeder automation.
- Customer interactive communications.
- Distribution SCADA.
- System integration.
- Smart substations.
- Use of real-time data.
- Network performance optimization.
- DA communications systems.
- RTUs, transponders, transducers.
- Fault sensing/circuit switching.
- Automatic meter reading.
- DSM implementation.
- Load control.
- Solid-state metering.
- Planning/staffing considerations.
- Economic evaluations/experience.

For more information about the call for papers, contact the Eureka Group at 415/747-9003, fax. 415/647-8892.

Utility financings increase 1990 to '91

ATLANTA—Investor-owned electric utility financings increased to $10.4 billion in 1991, up 25 percent from a year before, according to the final 1991 report from Ebasco Services Inc. Business Consulting.

The largest increase was in refunding, from $1.8 billion in 1990, to $4.1 billion in 1991.

Including natural gas, water and telephone utilities, investor-owned company financings increased 28 percent to $13.9 billion in 1991, Ebasco said.

COMMENTARY

Gas and electricity: an uneasy alliance

The recent joint conference of electric utilities and the gas industry that was held in Chicago explored problems and opportunities for these two old antagonists. Formerly just competitors for the retail customer, the gas and electric industries are beginning a new relationship. The potential for natural gas as a power generation fuel is the reason for the change, but the new alliance is not proving easy to develop.

Historically, natural gas has been a regional fuel for electric utilities in the southwest and lower midwest. Now, wider use is foreseen. In fact, electric power generation is seen as the major growth market for the gas industry in the 1990s. For a gas industry beset by low prices and sluggish demand, electric utilities could be their savior. In fact, gas demand from non-utility power generators over the last five years has been the one bright spot in an otherwise dismal market picture. To a large extent, low gas prices have fueled the non-utility power trend. The gas industry would like to entice utilities to follow the path blazed by non-utilities.

Utility base-load power plants, both new and existing, are the target. There have been few commitments for new base-load plants in recent years, but the potential for growth has the gas industry interested. The acid-rain retrofit provisions of the Clean Air Act raise the possibility that coal-fired plants will switch to natural gas to reduce sulfur dioxide emissions.

Deregulation is another issue the two industries share. A cloying federal regulatory burden that has contributed to the gas industry's problems is being lifted. Open access, competition, and market pricing are coming to the gas pipeline industry. The gas pipeline example is cited by some as a pattern for opening up electric transmission. Gas deregulation will have more immediate impact on electric utilities in their role as gas customers.

Unfortunately, the new alliance has some problems. Electric utilities, to a large extent, do not feel natural gas offers sufficient security in future availability and price predictability to be a reliable base-load power plant fuel. They do not trust the gas delivery system—if delivery capacity runs short residential gas customers will get a higher priority, leaving the power plant without fuel, electric utilities fear. Gas is OK for non-utilities building small power plant projects with a high return on investment and without a franchise obligation to deliver power on demand, they say, but not for us. Salesmen on the gas side of combination utilities can't get fuel buyers from the electric side to return their calls. This distrust can be seen clearly in the announced Clean Air Act compliance plans. There have been a dozen scrubber commitments, but no announcements that coal-fired units will be switched to natural gas.

Kenneth Lay, chairman of Enron Corp., a major long-distance gas pipeline company, told the joint conference that there is plenty of gas available in the U.S. at low prices. He said his firm is willing to enter into contracts with fuel purchasers for fixed prices for periods of up to 15 years. He said the rest of the industry will have to step up with similar long-term contract offers to give the electric industry the security it needs, and he expects that to happen.

Robert Smock, Editorial Director

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ABMA honors utilities for work on Zimmer

The American Boiler Manufacturer's Association recently presented its 1991 Public Service Award for Energy/Environment Achievement to American Electric Power Service Corp., Dayton Power & Light Co., Columbus & Southern Operating Co., and Cincinnati Gas & Electric Co. for their work in the nuclear-to-coal-fired conversion of the Zimmer plant. Pictured above at the award ceremonies, left to right, are: Russell Mosher, executive director, ABMA; Kerner Smith, president, ABMA; Pete Forster, chairman, president and CEO, DPL Inc.; Richard E. Disbrow, chairman and CEO, AEP; Jackson H. Randolph, president and CEO, CG&E; and Don L. McKenzie, vice president of marketing and sales-energy division, Zurn Industries Inc.

NEWS BRIEFS

JILL MINNER, Assistant Editor

NRC, Westinghouse to test advanced reactor

Westinghouse Electric Corp. has reached an agreement with the Nuclear Regulatory Commission (NRC) on an experimental test program to support design certification for the AP600, Westinghouse's advanced 600-MW reactor design with passive safety features. Westinghouse says it will share data with the NRC on three testing programs, two in the United States and one in Italy.

Tests on the AP600 passive containment cooling systems are currently being conducted at the Westinghouse Science and Technology Center near Pittsburgh, PA. Testing on the one-fourth-scale AP600 low-pressure integral systems is scheduled for Fall 1992 at Oregon State University in Portland, OR. In 1993, Westinghouse, in cooperation with the Italian utility ENEL, is planning to conduct full-pressure integral systems tests in Piacenza, Italy. The NRC is also considering conducting tests of AP600 large-scale, full-height, full-pressure integral systems in Tokai-mura, Japan.

New refrigeration/ac system is ozone-friendly

The New York Energy Research and Development Authority announced the introduction of the nation's first chlorofluorocarbon-free supermarket refrigeration and air conditioning system. The system, located at a supermarket in Glens Falls, NY, uses a new alternative to conventional chlorofluorocarbon (CFC) refrigerants that has no ozone-depleting potential. It also has a 90-percent lower global warming factor than most CFC refrigerants, according to the Energy Authority. "In addition to this being the first store to use the new CFC-free refrigerant, R-134a, the new compressor technology will make the store one of the most energy-efficient in the country," stated Hugh G. Farrington, president and chief operating officer of Hannaford Bros. Co., owners of the supermarket chain. Financial sponsors of the project are: New York State Energy Research and Development Authority, Empire State Electric Energy Research Corp., and Electric Power Research Institute.

WPS surpassed conservation goals in 1991

Wisconsin Public Service Corp. (WPS) met its energy conservation goals in 1991 at a lower cost than expected. The utility said its original $28-million budget was intended to conserve 15 MW. However by year-end WPS found it had spent only $17 million and conserved a total of 19 MW. WPS said two conservation programs it introduced last year, a flourescent lighting program and an appliance turn-in program, surpassed their goals within the first six months. "Both programs were overwhelmingly popular with our customers," noted Bud Treml, WPSC manager-marketing programs and services.

Electric vehicle associations merge

The Electric Vehicle Association of the Americas (EVAA) and the Electric Vehicle Development Association (EVDA) said they have merged in order to provide an accurate, authoritative, and accessible clearing house of up-to-date information on the development of the electric vehicle. "Having a focal point for the gathering of credible information on the development and deployment of electric vehicles in the United States and worldwide is important to our electric vehicle program," stated Robert L. Davis, electric vehicle program manager at Chrysler. Headquarters for the new organization, which will retain the EVAA name, will be located in Washington, DC.

ABB Power T&D reorganizes

ABB Power T&D Company Inc. said it has made a number of organizational changes. ABB Power Distribution Inc. has merged with ABB Power T&D, and ABB Power Systems Inc. and its former Advanced Systems Technology group have relocated to Raleigh, NC, where ABB's Transmission Technology Institute is located. "As the company has grown, we've brought together several areas that had been dispersed throughout ABB. Now we are integrating them into a single structure that reflects the way our customers do business," explained ABB Chief Operating Officer Joseph A. Carey Jr.

Global climate policy debate comes to a boil

Mark T. Hoske
News Editor

International discussions on limiting carbon-dioxide (CO_2) emissions may peak at a June United Nations-sponsored meeting in Rio de Janiero. So far U.S. policy has been to resist formal limits on CO_2, but international pressures, certain climate studies, and public opinion may be influencing policymakers. Global emissions-trading has been discussed at U.N. meetings.

Estimates for the costs or benefits of controls range widely, from more than $90 billion in 2000 (to cut under 1990 emission levels) to creating net savings through economic stimulus.

Utility impacts of carbon-dioxide emission limits could be immense.

If an international agreement results from the meeting, possible impact to utilities might include incentives for added efficiency measures and non-fossil power generation, disincentives for fossil-fired generation, possible CO_2 monitoring, or controls. Such measures could spur or dampen the economy, depending on who's guessing.

Environmental concerns have prompted several states to impose carbon-dioxide emission penalties on fossil-fired generation within integrated resource planning. Clean-coal technology proponents say new coal technologies are more efficient and should be encouraged.

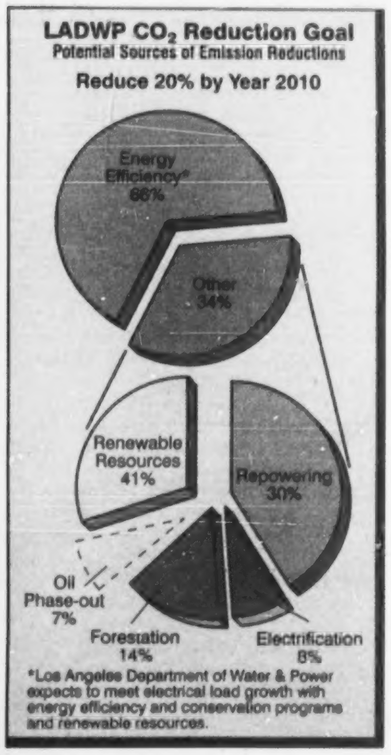
DOE study discourages cap

Dramatic reductions in CO_2 emissions could severely impact the economy from substantially increased taxes on gasoline and other fuels, according to the U.S. Department of Energy.

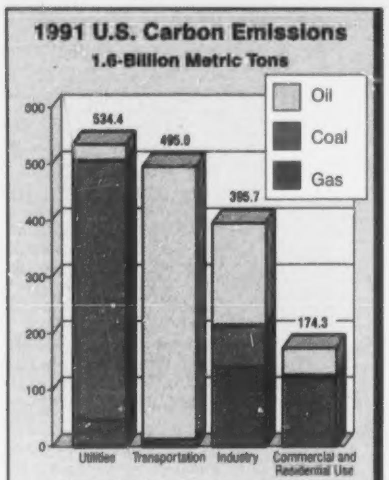
A DOE study, "Limiting Net Greenhouse Gas Emissions in the United States," says capping CO_2 emissions at 20 percent under 1990 levels would cost $95 billion a year by 2000.

U.S. Secretary of Energy James D. Watkins said, "Given these high costs, given the uncertain state of our knowledge about how greenhouse gases affect global climate change, and given the limited effect that action by any one nation can have on global greenhouse gas emissions, arbitrary emission reduction targets such as those studied here are clearly unwarranted," Watkins said.

Ned Helme, Center for Clean Air Policy, said some of the CO_2-control discussions at the United Nations prior to Rio conference were promising.



*Los Angeles Department of Water & Power expects to meet electrical load growth with energy efficiency and conservation programs and renewable resources.



1991 Total U.S. Energy Use

Fuel	Quad Btu
Oil	32.720
Nat'l Gas	20.156
Coal	18.807
Nuclear	6.543
Hydro	3.082
Other	.201
Total	81.508

Sources: DOE Energy Information Administration's Monthly Energy Review, March 1992; "Changing Degrees," Congressional Office Technology Assessment.

U.S. carbon emissions rose to 1.6 billion metric tons, up from 1.4 billion metric tons in 1987, a 14-percent increase. Combustion of fossil fuels release carbon dioxide, a so-called "greenhouse" gas. The inset shows non-carbon-producing source of energy and contribution to energy use. "Other"—wood, wind, waste, solar—would have to expand 90-fold to match coal. (Totals, above, may not add, due to rounding. The analysis uses the following conversions, in carbon/mmBtu: coal 57.5 lb, oil 45 lb, natural gas 32 lb.)

"The U.S. is moving a lot closer to a treaty than might be apparent at first glance," Helme said, in a March meeting of state regulators.

Helme characterized a carbon cap as something utilities could live with in cost-effective ways until technology catches up with expectations.

Policy issues include

Among the plethora of related global-climate policy questions are:

- Will the U.S. consent to a firm limit or voluntary target for suspected greenhouse-gas emissions?
- Will President Bush attend the summit, formally called the U.N. Conference of Environment and Development? As many as 180 heads of state may attend. One of the conference goals is to promote sustained global growth and minimize human environmental impacts. Detractors call it a platform for developing nations to seek added economic and development aid.
- Would the brunt of voluntary or mandated U.S. controls hit central-station sources, like utilities, or be split fairly among sectors, especially oil for transportation?
- And if the U.S. decides to implement controls, voluntary or not, would they be command-and-control, carbon taxes, an emission trading system, or a combination?

Petroleum is the greatest contributor by fuel to U.S. 1991 carbon emissions, at a total of 736 metric tons (see chart above). Oil's contribution for transportation at 482 metric tons topped utilities' use of coal at 461 metric tons. Utilities point out that electricity can displace less efficient or environmentally attractive forms of energy use.

Renewable resources contribute a tiny percentage to overall energy use, compared to oil, showing how difficult a significant replacement strategy might be. Using electric vehicles could allow more efficient use of existing generating resources, perhaps displacing oil, with baseload nuclear power. Natural gas has a lower carbon content than other fossil fuels and is expected to contribute more in generation and transportation sectors.

Plant trees, collect CFCs, cut CO_2

Planting trees, grasses, or other store-houses for carbon might be one way for many utilities to comply with a cap, said Helm.

American Electric Power, one of the largest U.S. users of coal for electric power, produces 5 percent of U.S. utility CO_2, or 1.5 percent of the total U.S. contribution. Costs of capping AEP's 1.1-percent growth rate could amount to $1.6 billion by 2015, or 20 percent of AEP's revenue requirement. Tree planting could cut cap costs to just 2 percent, by far the cheapest compliance method, Helme explained. "This can buy a significant 30-year transition period," Helme said.

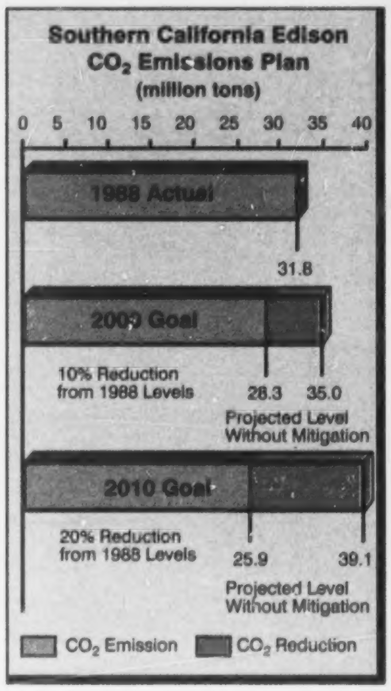
Recent tree planting efforts at other utilities include Union Electric (see photo) and Los Angeles Department of Water and Power. LADWP is part of a plan to plant 50,000 seedlings a year.

UE's tree planting "GreenLeaf" program, awarded cities in its territory 17 grants worth more than $23,000 in 1991. The program, started in 1989, funded the reforestation of parts of cities, such as St. Louis.

Research indicates that, in addition to storing carbon, city foliage can help reduce the urban "heat islands" that raises temperature of cities 2-8°F in summer afternoons. Environmental Protection Agency says this effect has raised temperatures in LA, Washington, DC, and Baltimore by 4-5°F over a century ago.

California, among the strictest U.S. emission-control areas, has two utilities volunteering to cut CO_2 by 20 percent by 2010.

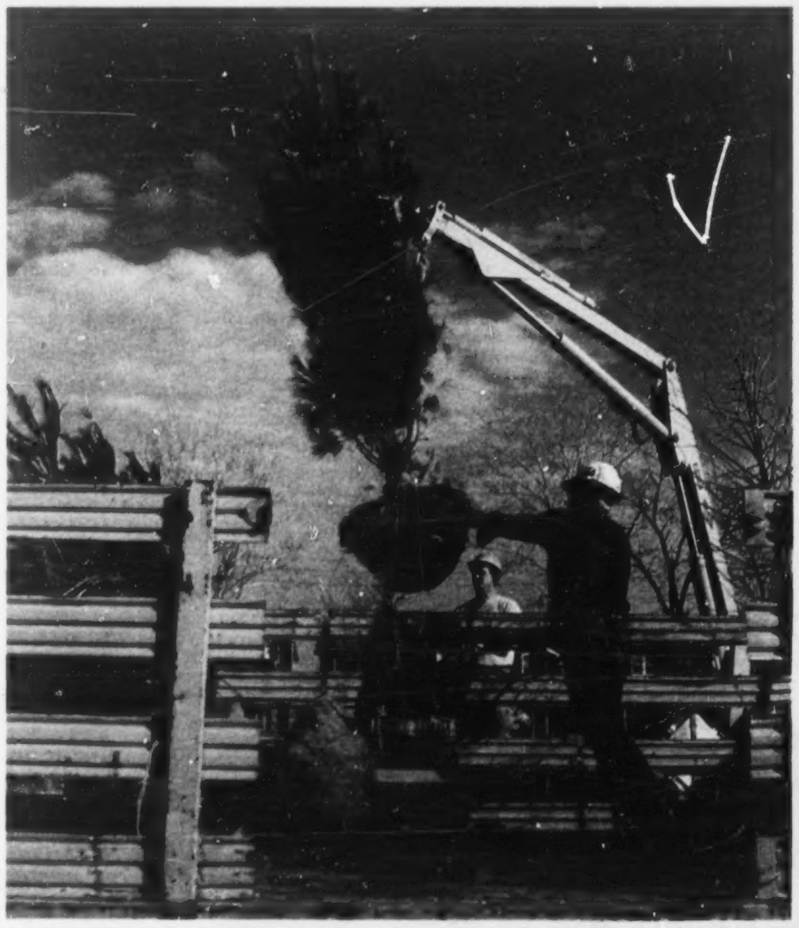
The May 1991 plans, from Southern California Edison and LADWP, include some efforts by others within their service territories (see graphics).



Offset strategies

New England Electric System's strategic plan follows National Academy of Sciences recommendations for cutting greenhouse gases. These include looking into offset strategies such as tree planting, chlorofluorocarbon recycling from appliances, methane recovery at coal mines, use of coal ash for concrete, and enhancement of marine algae growth to absorb CO_2. NEES will start pilot renewable generation projects.

"With this plan," said Doug Foy, of the Conservation Law Foundation environmental group in Boston, NEES "issued a serious response to greenhouse concerns."



Union Electric tree planting program helps cool city neighborhoods like Trinity Square in St. Louis.

GAO says utilities must continue storing nuclear wastes onsite

WASHINGTON—Most states expect to manage their low-level wastes after Jan. 1, 1993, by having electric utilities with nuclear plants and other producers of low-level radioactive wastes store them onsite until state-sponsored disposal facilities are ready.

This is because the states have not responded well to their mandated responsibilities for storing low-level waste from nuclear facilities, said the General Accounting Office in a recent report. The GAO's report, 'Nuclear Waste: Slow Progress Developing Low-Level Radioactive Waste Disposal Facilities," noted that the governments' responsibilities were spelled out in Congress' Low-Level Radioactive Waste Policy Act of 1980.

Now, of the 13 states planning to develop new disposal facilities, most have made progress, said GAO. But only one, California, is expected to have its facility operating by the time those states with existing facilities can deny access to waste generators in other states.

In addition, most of the other 12 states were not scheduled to have their facilities ready until 1996, or later.

The report also enumerates problems encountered since the states—either individually or through groups called "compacts"—were made responsible for the waste generated within their own borders. The study discusses:

- The states' progress and problems in meeting facility development milestones in the law.
- Federal and state efforts to resolve issues related to mixed waste and waste with low levels of radioactivity.
- The Dept. of Energy's progress in discharging the federal government's responsibility under the law to manage the most hazardous low-level waste.

Because of the slow movements the states were making, in 1986 Congress extended the deadline for them to build new disposal facilities from the original date set of Jan. 1, 1986, to a new date of Jan. 1, 1993.

The states blamed the complex process involved in siting and building the repositories for the delays. As an example, state officials described the efforts to involve the public and the resulting public opposition that had to be taken into account in their efforts and time schedules. This opposition has been especially evident during the selection process for potential sites.

Confined-Zone Dispersion cuts SO_2 emissions in half

WASHINGTON—Preliminary test results for the Confined Zone Dispersion (CZD) process indicate it could be an effective, near-term option for utilities to use to clean up SO_2 emissions from older, coal-burning power plants.

Under the Department of Energy's Clean Coal Technology (CCT) program, the initial results from commercial-scale test of this sorbent injection process met or exceeded its goal of a 50-percent reduction in SO_2 emissions. The tests were performed on Pennsylvania Electric Co.'s 74-MW Unit 15 at its Seward Station near Johnstown, PA.

According to DOE, the results increase the likelihood that the pollution control technique will be ready for commercial deployment at older power plants or those with little space to spare in time to meet the 1995 SO_2 emission reduction requirements of the Clean Air Amendments Act of 1990.

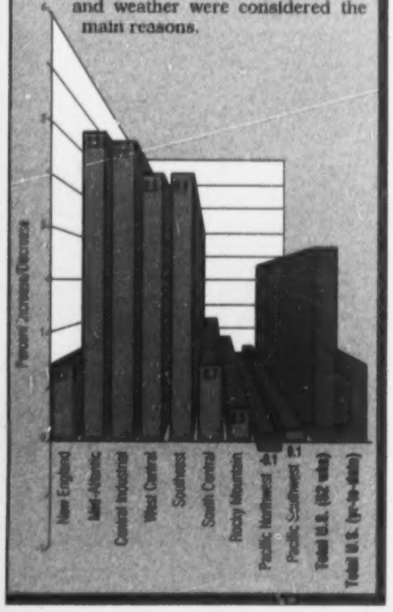
While not able to achieve the 90-95-percent sulfur removal efficiencies of scrubbers, sorbent injection systems are less expensive to build and operate. Based on data developed by the CCT project, the cost of retrofitting a power plant to utilize CZD technology would be about $25/kW. Operating costs are projected at less than 3 mills/kWh.

Process wastes are dry and relatively easy to handle. No further treatment is needed for their disposal.

Retrofitting at the Seward plant with the Bechtel Corp.-developed process began in March 1991 and was completed four months later. One of the plant's ducts was replaced with a 110-ft straight duct to provide sufficient residence time for the CZD lime slurry to capture the flue gas SO_2.

ELECTRIC OUTPUT
Growth Mixed

Changes in net electric output from the Mainland U.S. electric utilities continued to vary widely for the 52 weeks ending March 21, as reported by Edison Electric Institute. Variations in economic recovery and weather were considered the main reasons.



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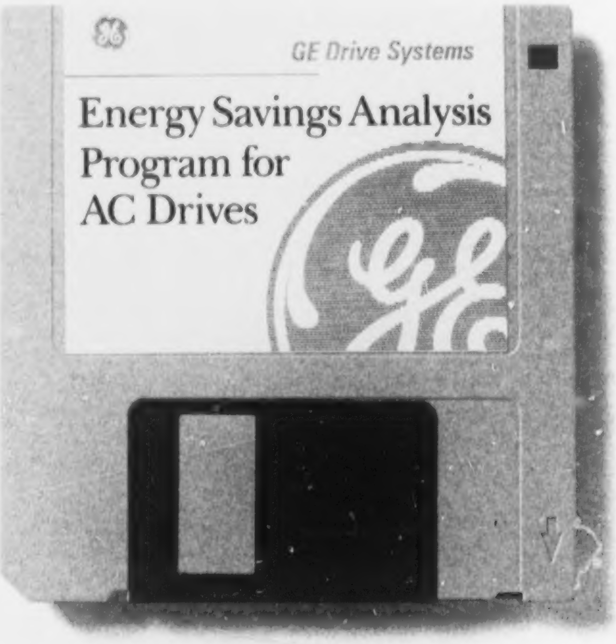

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LATE NEWS

Advanced Battery Consortium picked a nickle-metal hydride battery for electric vehicles (p.16).

The House dropped global warming provisions from its energy bill.

Utilities refigure fuel planning to take advantage of the FERC's Rule 636, which restructures the natural gas industry.

Tennessee Valley Authority's Marvin Runyon will be postmaster general in July. He streamlined TVA, cut employees by 40 percent, and pushed nuclear power. No replacement was named.

WPL sells first sulfur dioxide credits

Bob Smock, Editorial Director
Mark Hoske, News Editor

MADISON, WI—Wisconsin Power & Light President Erroll Davis announced that his company has sold 10,000 sulfur dioxide allowances to Tennessee Valley Authority and from 10,000 to 25,000 more to Duquesne Light Co.

Davis called the transactions the first publicly announced allowance sales under provisions of the Clean Air Act Amendments of 1990.

He did not reveal the price but said allowances are currently trading in the range of $250 to $400 per allowance. WPL expects to ultimately sell from 80,000 to 120,000 allowances, said Davis at a May 12 press conference here.

(At $325 per credit, transactions totalling 27,500 allowances would amount to more than $8.9 million.)

"This is a competitive marketplace and I don't want to divulge too much about our marketing strategy," he explained. The TVA sale was arranged through a broker, Davis added, and the Duquesne Light Co. sale was negotiated by the two utilities. "Market prices," Davis said, "are based on the buyer's and seller's perceptions of value."

Wisconsin Power & Light is able to sell allowances because stringent state environmental regulations have reduced emissions from the utility's three Phase-1-affected generating units to levels well below their allowances. Those coal-fired units are the 330-MW Edgewater 4 with 24,750 allowances, the 110-MW Nelson Dewey 1 with 6010 allowances, and Nelson Dewey 2 with 6680 allowances.

"Emission credits to burn"

"We have emission credits to burn in this state," said C. D. Besadny, secretary of Wisconsin' Department of Natural Resources at the press conference announcing the sale.

WPL's Davis said, "We are selling timing. These allowances will allow companies to come into compliance in the most cost-effective way."

Davis noted that the allowances will be delivered in 1995 and that they have no expiration date. Asked why he was willing to be the first to announce a sale, Davis said, "We are not hesitant to make the market."

Regulatory treatment, market future

In a later telephone interview Davis explained further, "We're making the market with this transaction. TVA hopes the price goes way up. I hope it goes way down."

Asked about potential regulatory treatment, WPL's Davis said, "The chairman of the Wisconsin Public Service Commission spoke glowingly, no, better make that positively, about emissions trading." Asked whether that praise assured positive regulatory treatment, Davis noted that all utility transactions are subject to regulatory scrutiny.

No determination has been made on who will get the benefits of the transaction, but Davis said customers would be the primary beneficiaries.

TVA sees allowances as insurance

TVA's William Malec, senior vice president for finance, said that TVA plans to use the allowances around the turn of the century. He said that TVA's current SO_2 emissions are about 1.2-million tons. Those emissions will decline to 800,000 tons after the 1995 Phase 1 deadline and 450,000 tons after the Phase 2 deadline in 2000.

"As allowance purchasers," said Malec, "we have been testing the allowance market for some time." He noted the possibility that TVA may not use the allowances purchased from WPL and may resell them.

Malec said "We're looking at this purchase as insurance" to help if a scrubber is delayed or a major outage occurs. He added, "It helps develop the market for allowance trading and it might help TVA later if we want to buy or sell additional credits."

The 10,000-ton TVA transaction is small for TVA, totalling less than 1 percent of present TVA emissions, Malec pointed out.

TVA has announced that it will install scrubbers on its Cumberland units 1 and 2, 1300 MW each, as part of its Phase 1 compliance strategy which is expected to cost from $750 million to $850 million in capital expenditures. Other units will be brought into compliance via fuel switching.

TVA said it has joined an allowance pooling group formed by utilities that are installing Phase 1 scrubbers. Members in the pool will share in bonus allowances created by installing high-efficiency scrubbers by the 1995 deadline.

Asked if TVA's affiliation with the federal government make it the logical first buyer, Malec said, "This transaction was independent of TVA being a federal agency. Developing an active allowance market will permit the lowest possible cost of compliance for all U.S. utilities."

WPL has more to sell

What advice would WPL offer for other utilities looking to join the market?

"We'd entertain calls," said Davis, suggesting that WPL has more allowances to sell. He wouldn't say if other transactions were pending, however.

"If we strike a deal and the other party wants to make the transaction public, then we'll do so. That's what I like about this new competitive market. We don't have to tell as much," Davis said.

"I wouldn't want to give away confidential information," he laughed.

WPL Holdings is the Madison, WI-based parent company of WPL. DQE Inc., based in Pittsburgh, PA, owns Duquesne Light.

Carbon caps lose favor

WASHINGTON—In preparation for the United Nations-sponsored Earth Summit in June, 143 nations reached non-binding agreement for limiting emissions thought to contribute to global warming. The target is for major, developed nations to limit suspected emissions, including carbon-dioxide, to 1990 levels.

As a result of the non-binding nature of the agreement, President George Bush said he would go to the UN meeting in Rio de Janeiro.

The Rio meeting, June 3-14, may be the largest-ever gathering of world leaders, with more than 100 expected to attend. U.S. participation had been in doubt because of previous UN meetings that suggested a mandatory cap was likely (*EL&P*, 5/92, p.17).

House legislation proposes limits

In a separate, but related development, the administration and major utility industry groups condemned House legislation that would cap CO_2 emissions at 1990 levels by 2000, a drop of 19 percent from projected 2000 levels. That bill, sponsored by Rep. Henry Waxman (D-CA), may become part of the House energy bill.

The overall cost of compliance, according to Department of Commerce studies, would be a $92-billion annual reduction in U.S. gross national product and cost more than 500,000 jobs by 2000. Bush threatened to veto U.S. energy legislation containing such provisions.

The Edison Electric Institute, American Public Power Association and National Rural Electric Cooperative Association have spoken against mandatory CO_2 emission cuts.

An administration report released in April titled, "U.S. Views on Global Climate Change," says, in-part that the administration's National Energy Strategy would cut emissions 7-11 percent by 2000, using efficiency and technology advances and avoiding command-and-control measures. Many NES provisions are in pending energy legislation.

Sources from the House and Senate indicate the energy bills could be in conference committee by June, and passed before the August recess.

The administration, in global-climate discussions, has sought flexibility in reductions without capping emissions as some other industrial nations favored. The U.S. contends that flexible guidelines and technology can limit emissions and promote growth, while

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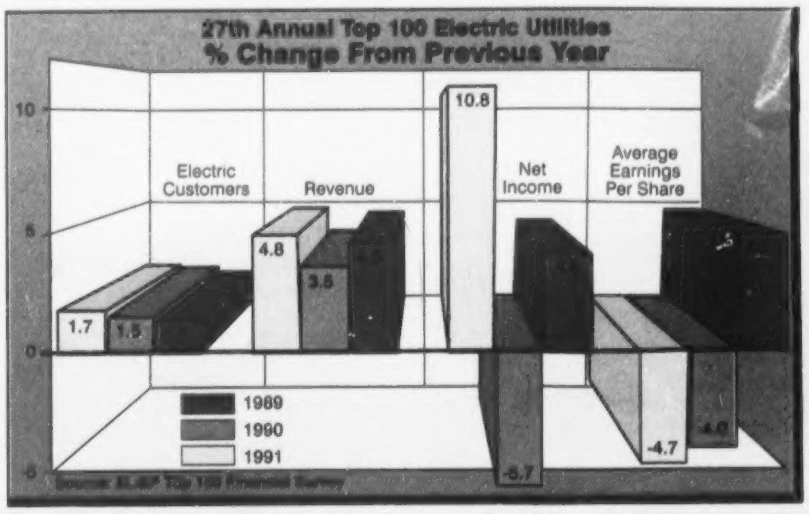

Top 100 Financial results suggest an industry turnaround. See the full report starting on page 13.

DOE issues solicitation for fifth Clean Coal Technology round

WASHINGTON—The Department of Energy sent out Solicitation No. DE-PS01-92FE62647, Draft Program Opportunity Notice for Clean Coal Technology V (CCT V) in late April to more than 3000 individuals who had expressed interest in the CCT program. The closing date for submitting proposals for demonstration projects for CCT V cost sharing by DOE is Dec. 7.

This draft not only asks for proposals for projects, it also asks for comments on the draft itself. Comments must be submitted before the final Program Opportunity Notice is released by July 6.

The draft notice contains detailed information on criteria to be used in evaluating proposed projects, along with submittal instructions.

About 8568 million has been allotted by DOE to fund CCCT V projects in this final scheduled round of competition.

DOE is looking for proposals that "advance significantly the efficiency and environmental performance of coal using technologies that are applicable to either new or existing facilities." Only proposals that satisfy qualification criteria and preliminary evaluation will be considered for "comprehensive" evaluation for the CCT program.

Proposals must remain valid for a period of acceptance of at least 365 days from Dec. 7. DOE expects to complete evaluation and selection of proposals within five months after submission, or by May 6, 1993.

All communications with DOE about the solicitation should cite the draft proposal number and be addressed to: U.S. Dept. of Energy, Office of Placement & Administration, Office of Management Support, Forrestal Bldg., Rm 1J-005, 1000 Independence Ave., SW, Washington, DC, 20585, Attn: Document Control Specialist (PR-33). For more immediate information about the solicitation, call: Herbert T. Watkins at DOE at 202/586-1026.

The first four CCT solicitations were issued in 1986, 1988, 1989, and 1991. As of early May, 42 projects were active in the program, with 15 of them completed or in operation.

Water won't upwell into Yucca repository

WASHINGTON—The National Academy of Sciences' National Research Council (NAS/NRC) declared in mid-April that the proposed high-level radioactive waste depository was not at risk for groundwater infiltration. The findings are contrary to those presented in a 1989 report by a Department of Energy staff scientist.

The NAS/NRC report, "Ground Water at Yucca Mountain: How High Can It Rise?" was written by a 17-member panel after a two-year study. The panel concluded that the evidence of groundwater upswelling in and around Yucca Mountain could not be reasonably attributed to coupled hydrologic/tectonic hydrothermal systems. In other words, groundwater had not percolated up into the proposed facility from below and would not in the future. It dismissed the opposite view put forth by DOE geologist Jerry Szymanski.

Headed by C. Barry Raleigh, dean of the University of Hawaii School of Ocean & Earth Sciences and Technology, the NAS/NRC group focused on whether calcite veins in the mountain were deposited by water from below or by rainwater. The panel report says, "In fact, the evidence strongly supports a surface-process origin from rainwater for the vein and surface parallel carbonate and carbonate silica deposits throughout the Yucca Mountain area."

The council panel also ruled as negligible the chances of volcanic activity or an earthquake seriously raising the underlying water table.

Why it's so important

The controversy over the two reports is important because the most likely cause of radioactivity from spent fuel rods contaminating the environment outside the repository will be with water entering the storage space and carrying radionuclides into the groundwater system. Such water would have to come up from below, since rainwater is easily blocked from entering the space.

DOE Secretary James D. Watkins praised the panel for their thoroughness and objectivity.

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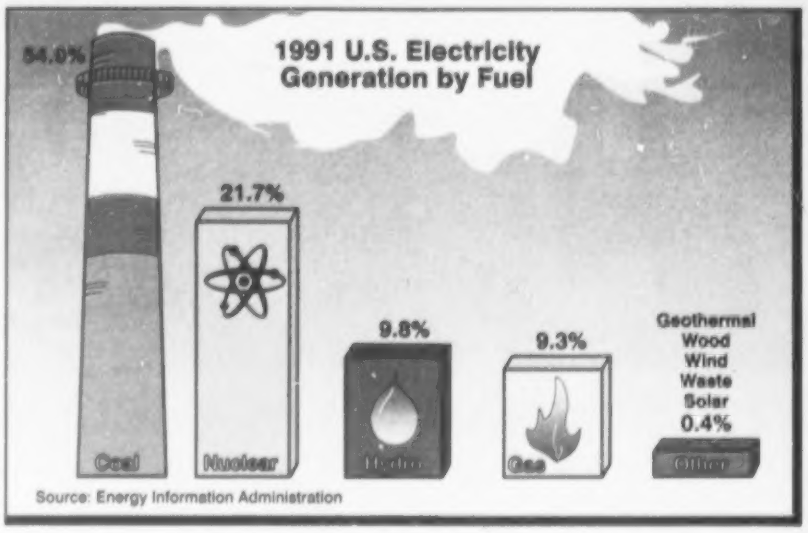


Source: Energy Information Administration

Electric utility performance improves

Numbers from several sources point to improved performances in the electric utility industry for 1991.

Most nuclear generation performance indicators and total generation and sales improved, while prices fell. Many areas of performance for leading investor-owned utilities also improved (p.13).

Nuclear performance improves

The Institute of Nuclear Power Operations (INPO) showed that unit capability factor improved 4 percent from 1990-91 to 75.7 percent, the largest gain since INPO started record keeping in 1980. The 1995 goal is 80 percent.

Low-level waste from nuclear plants exceeded a 1995 goal in 1991, 243 cubic meters for BWRs and 85 cubic meters for PWRs.

Although 1991 thermal heat rate increased slightly in 1991 to 10,220 Btu/kWhr, from 10,218, the 1990 goal was 10,260, which has been met since 1988.

The number of unplanned automatic scrams, the amount of collective radiation exposure, and safety system performance all improved.

Electric sales

According to the DOE's Energy Information Administration, in 1991:

- Electric sales increased 2 percent to 228 billion kWh.
- Total net generation increased an estimated 0.5 percent to 2,822 billion kWh, compared to 1990.
- Real electric prices fell 2 percent.

Reorganized Siemens Power makes first gas turbine in U.S.

MILWAUKEE—Siemens Power Corp. completed its first gas turbine manufactured in the U.S., one that will be exported to the Taiwan Power Co. The 100-MW V84.2 gas turbine will go into operation in June 1993.

At the rollout on May 6, R. Baird Stephenson, scheduled to be president and CEO of the new Siemens Power Corp., said, "This is a significant achievement for a company that hasn't officially begun operation as a consolidated unit."

Siemens Power is part of the worldwide Siemens Power Generation Group (KWU), which has its headquarters in Erlangen, Germany, and employs more than 400,000 people. Nearly 30,000 of these are in the U.S.

Stephenson, currently still president and CEO of Siemens Nuclear Power Corp., was referring to the consolidation of the entire Siemens KWU U.S. organization, due to take effect officially on Oct. 1, the start of the firm's fiscal year.

The V84.2 turbine uses a hybrid burner design operating in a twin combustion chamber that allows Siemens to guarantee the unit will produce less than 9-ppm NOx emissions and carbon monoxide emissions near the undetectable end of measurement instruments' abilities.

Each burner can operate with either of its built-in diffusion or premix flame nozzles. This hybrid configuration allows the burner to be set in the diffusion burning mode for startup and then switched, when output reaches about 45 percent, to the premix operation for low-NOx emission.

Although U.S. content (parts and labor) of this first gas turbine was only 30 percent, Hans Boehm, head of Siemens Fossil Power Generation, assured listeners at a special meeting the next day at the West Allis, WI, A-C Equipment Services plant that this amount would be raised to 60-70 percent as quickly as feasible.

Stephenson stated that he expected the suburban Milwaukee plant to produce 10-12 of the gas turbines per year and begin steam turbine production by the end of '92. To achieve these ends, he noted that parent Siemens Power Generation Group planned to invest 830 million in the facility in the next 2½ years.

On Oct. 1, Siemens fossil and nuclear power generation units will be consolidated into Siemens Power Corp., headquartered in Bellevue, WA, (Nuclear Div.) and Milwaukee (Fossil Div.). The new operating company will provide U.S. customers with a single source for power generation products and services.

Besides absorbing A-C Equipment Services' gas turbine manufacturing and servicing facilities, Siemens Power will be comprised of the combined assets and affiliates of the nuclear fuel development and manufacturing facilities in Bellevue and Richland, WA; nuclear service facilities in Chattanooga, TN; and Fossil Div. sales, marketing, and administration offices in Bradenton, FL. The company also will oversee the Siemens part interests in Rofin-Sinar (laser cutting and welding systems), San Jose, CA, and Siemens Solar Solar Industries, Camarillo, CA. Siemens Power Ventures Inc., New York, will remain as an independent entity.

Externalities: regulators see benefits; utilities cite cost

CHICAGO—How much will utility customers pay in higher electric bills for perceived societal benefits?

While that question is central to environmental regulation, it can be particularly sensitive when determining the source, type, or fuel for new generating capacity.

This is one of the principal dilemmas behind environmental externalities, or adders, identified at a session of the American Power Conference, held here April 13-15.

A tool to promote specific choices

Externalities are regulatory additions or subtractions made to the estimated cost of supply or demand-side options during the planning process. Regulators increasingly are using them to influence utilities' decisions, mostly away from fossil fuels, usually coal. Externalities can also promote options such as renewables, or conservation, often within an integrated-resource-planning or least-cost-planning process.

Michael Holstein, with Atlanta-based Energy Management Associates, used an externalities definition from Pace University Center for Environmental Studies: "costs which occur after all government-imposed environmental standards and regulations are met."

He described the kinds of externalities now in place, or under development, in various states (see table). At least five states have externality programs under development, while nine more have provisions in place.

Percentage adjustment

Some states award a percentage adjustment or points to influence choices in planning. Wisconsin regulators, said Holstein, add 15 percent to net present value of revenue requirements for fossil-fueled generation when compared to demand-side options or renewables.

Another way is to "monetize" the process by adding cents per kWh to some options.

This can be based on an estimated cost of controlling the pollutant, or some quantification of an environmental damage assessment. Externalities included are NOx, SOx, CO_2, VOCs, particulates, CH_4, N_2O, and water and land use. Values assigned to each vary widely.

Status of Recognizing Externalities
Under Development
– Connecticut – Georgia – Michigan – Minnesota – Oregon
Monetized
– California – Massachusetts – Nevada – New Jersey – New York
Points Awarded or % Adjustment
– Colorado – Iowa – Vermont – Wisconsin
Source: Energy Management Associates

NOx damages: $27,676/ton

According to the Electric Power Research Institute, assigned values for NOx range from a high of 827,676 per ton in California, down to 8101 per ton in the east portion of Bonneville Power Administration. Per ton values for CO_2 are 87-107; SO_2, 81274-827,436.

The bar chart shows residual environmental costs attached to coal, pressurized-fluidized bed and combined-cycle generation by New York, Massachusetts, and Nevada, in cents per kilowatthour.

The Department of Energy and others plan to determine full life-cycle costs of various fuels, which, some argue, would give a more complete and fair assessment of environmental costs attached to generating options.

Trends in externalities within least-cost planning include emphasis of conservation over load-management programs, gas over coal, and promotion of renewables, Holstein said.

Externalities can cause problems, he said, including creating more pollution.

A simple adder on baseload coal generation might prevent construction of a baseload unit that could displace older, less efficient plants, he explained. Dispatch of generation might be a logical extension of environmental externality costs, said Holstein.

When externalities increase costs, some customers may "vote with their feet," and move, or expand elsewhere, he said.

Also, "alternatives may exist with greater environmental benefits, at a lower cost," Holstein said. These might get passed over in an IRP process with externalities.

Holstein emphasized uncertainties.

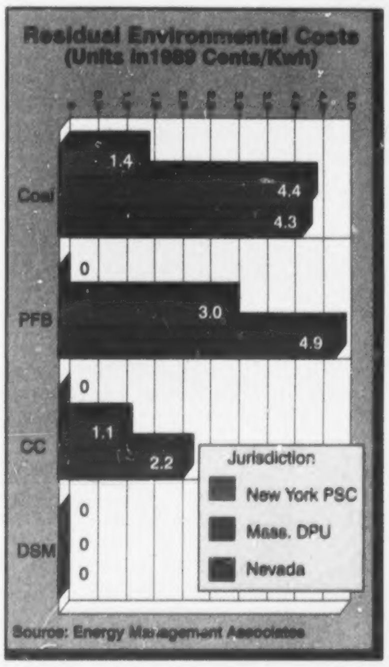
"Utilities have the enviable position of planning based on predicted environmental regulation, and if they're wrong they get penalized for it."

Other developments

In other externality developments:

- Electric Power Research Institute started the "Environmental Externalities Information Clearinghouse" on the EPRINET electronic bulletin board for members.
- Recent planning goals outlined by the California Public Utility Commission said "Monetary value is given after all mandatory pollution abatement measures have been implemented. A negative value is put on residual emissions and that negative value increases the total cost of resources with high levels of residual emissions."
- The National Rural Electric Cooperative Association at its 50th Annual meeting passed a resolution that said externality costs should be scientifically derived, realistic, equitable and not speculative.

Addressing California regulators directly in later comments, the NRECA said that artificially inflating the cost of coal-fired electricity might be economically and environmentally counterproductive.



Source: Energy Management Associates

Federal gov't awards utility wildlife efforts

WASHINGTON—Kansas Power & Light Co. won the Corporate Wildlife Stewardship Award from the U.S. Department of Interior's Fish and Wildlife reservce.

KPL is the third recipient, and the first electric utility, to receive the annual award. The award cites corporations for enhancing the environment and outstanding contributions to conservation and wildlife management.

KPL, now operating under the name Western Resources, established a task force to make environmental protection "a part of day-to-day operations," said Fish and Wildlife Service Director John Turner in making the award.

The company's efforts include:

- Transformation and restoration of wetland areas with wildlife departments of Oklahoma and Kansas.
- Construction of roosts for large birds and an eagle rehabilitation flight pen.
- Extensive recycling programs for tree clippings, fly ash, scrap metal, tires, oil, batteries, and other wastes.

Two KPL utility workers survey Nowata wetlands, a former, 1100-acre oil and gas field that the company helped transform along the Verdigris River in Oklahoma.

Syncoal project starts up early

COLSTRIP, MT—The Rosebud Syncoal Partnership project started up in late March, ahead of schedule. The goal of this Clean Coal Technology project is to demonstrate an advanced thermal drying and physical coal-cleaning process that can reduce moisture and raise heat content of low-rank subbituminous and lignite coals.

The plant, located next to Western Energy's Rosebud Mine, was originally scheduled to take 18 months to build and bring into operation. Instead, the process was completed in 10 months, with much of the work done during the winter.

Testing begins

The partnership began sending Powder River Basin coal through the plant for cold-flow testing on Jan. 30. This was followed with short-duration production runs. Gradual production of the syncoal product began at the "start-up" in late March. The plant was expected to reach full operation in late spring.

In continuous, full operation the facility will produce 1000 tons/day (or 300,000 tons/year) of upgraded solid fuel. It is only one-tenth the size of a full commercial-scale plant, even though its processing equipment is commercial-scale.

What it does

The syncoal process reduces moisture content of the coal from 25 percent to as low as 1 percent and raises the heating value from about 8600 Btu/lb up to 11,700 Btu/lb.

The fuel's sulfur content is only 0.3 percent, which means it can be burned in many existing coal-fired plants to meet emissions standards of the Clean Air Act Amendments of 1990.

The demonstration plant is integrated with a unit train loading facility and a stockpile that can hold up to 90,000 tons of coal.

Shipments begin

The first 5000-ton shipment was scheduled for Northern States Power Co.'s Riverside plant near Minneapolis where it will be used for an initial test burn. Dairyland Power Cooperative committed to test burn the next 5000 tons at its Alma Station about 20 miles south of Eau Claire, WI.

Rosebud Syncoal is working on plans with other utilities for test burns.

Total project cost is 869 million, with the Department of Energy providing half of that amount.

Acquisition update: Colorado, New England transactions are done

In utility merger and acquisition news, six utility companies reported transactions.

Three utilities completed acquisition of Colorado-Ute Electric Association, which had filed for Chapter 11 bankruptcy protection.

The transaction totalled more than 8800 million.

As previously reported, three utilities split customers and assets: Public Service Co. of Colorado, PacifiCorp, and Tri-State Generation and Transmission Association (*EL&P*, 8/91, p.1).

In New England

In an unrelated transaction, UNITIL Corp., a utility holding company based in Bedford, NH, acquired Fitchburg Gas and Electric Light Co., of Fitchburg, MA.

COMMENTARY

What deregulation?

If the electric utility industry is in the process of being deregulated then why is the heavy hand of the regulator heavier than ever and likely to get even heavier in the future?

One answer is that while some regulators at the federal level, mainly at the Federal Energy Regulatory Commission, are moving the industry toward market pricing, competition, and deregulation, most of the rest of the regulatory community is clamping down.

At the state level, in particular, utility regulation is being increased. State public utility commissions are becoming more involved in the utility planning process and, in many cases, mandating what the plan must be, based on political considerations.

State and federal regulators are moving in opposite directions. Ohio PUC Commissioner Ashley Brown, a leading state regulator, told the American Power Conference that while this difference is "philosophically irreconcilable" it is a reality that will probably continue. FERC will concentrate on regulating bulk power supply where more competition is possible, while state regulators focus on the rest of the utility business.

However, that leaves most of the utility/regulator interface in the state realm where the strong hand of government is increasing. State regulators are not limited to T&D operations, customer relations, and retail prices. They are also intimately involved in bulk power supply through the planning and approval processes and this involvement is increasing. More and more states are forcing utilities to do integrated resource planning or least-cost planning.

The purpose of IRP and LCP is to inject a bias in utility planning against supply-side alternatives—the new euphemism for power plants. State regulators who don't like power plants are forcing utilities to adopt other choices in their plans. A favorite new technique for achieving this is to dictate to utilities how they must internalize "externalities" in their evaluation of alternatives. Externalities are environmental costs that are not directly quantifiable, such as estimated health costs to society caused by allowed emissions or an estimated cost for an unregulated "pollutant" such as carbon dioxide. When regulator-mandated external cost estimates are added to the actual cost of a coal-fired power plant, for example, then other alternatives such as demand-side management turn out to be the least-cost choice.

There's a danger that regulations like this will skew planning too much in favor of expensive conservation or demand-side-management programs, warned David Porter, senior vice president of Wisconsin Electric Power, at the American Power Conference. There's a danger of "least cost at any cost," said Porter. He noted that his company has been involved in IRP for the past 10 years and that it's here to stay, but he pleaded for reasonableness. DSM, said Porter, cannot be expected to reduce base load growth more than about 10 percent. IRP goals of 50 percent or more are unreasonable, he said.

The rest of the world is moving away from central planning. Tightly regulated, state-owned electric utilities are being privatized and deregulated. But not here. The heavy hand is getting heavier.

Robert Smock, Editorial Director

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Gap widens between most and least expensive summer electric bills

Twelve Most Expensive Companies

Company Name	State	Avg. Cost Cents/kWh	Summer 1991 National Rank
Long Island Lighting Co.	New York	$0.157	1
Consolidated Edison Co. of N.Y.	New York	$0.150	2
Philadelphia Electric Co.	Pennsylvania	$0.147	3
Pennsylvania Power Co.	Pennsylvania	$0.144	4
Duquesne Light Co.	Pennsylvania	$0.141	5
Orange & Rockland Utilities, Inc.	New York	$0.138	6
Hawaii Electric Light Co.	Hawaii	$0.137	7
Cleveland Elec. Illuminating	Ohio	$0.137	8
Commonwealth Electric Co.	Massachusetts	$0.137	9
Nantucket Electric Co.	Massachusetts	$0.136	10
Citizens Utilities – Kauai Div.	Hawaii	$0.131	11
Toledo Edison	Ohio	$0.129	12

Twelve Least Expensive Companies

Company Name	State	Avg. Cost Cents/kWh	Summer 1991 National Rank
Washington Water Power Co.	Idaho	$0.042	192
Washington Water Power Co.	Washington	$0.043	191
Pacific Power & Light Co.	Washington	$0.044	190
Idaho Power Co.	Idaho	$0.047	189
Idaho Power Co.	Oregon	$0.047	188
Portland General Elec. Co.	Oregon	$0.047	187
Pacific Power & Light Co.	Montana	$0.048	186
Kentucky Utilities Co.	Kentucky	$0.051	185
Puget Sound Power & Light Co.	Washington	$0.054	184
Montana Power Co.	Montana	$0.054	183
Minnesota Power & Light Co.	Minnesota	$0.055	182
Pacific Power & Light Co.	Oregon	$0.055	181

Source: National Association of Regulatory Utility Commissioners

Some residents paid 373 percent more than others for their electric bills last summer, according to a survey by the National Association of Regulatory Utility Commissioners. Washington Water Power Co. residential customers in Lewiston, ID, paid the least for their 1991 summer bills, 4.2 cents per kWh, while customers of Long Island Lighting Co. in Long Beach, NY, paid the most, 15.7 cents per kWh.

NARUC's national survey showed that the gap between least and most expensive summer utility rates widened from 1990 to 1991. A 350-percent gap in 1990 increased to 373 percent in 1991, according to NARUC.

The average cost of electricity across the nation last summer was 8.9 cents per kWh. Summer residential bills increased 3.5 percent from 1990 to 1991.

In its report, NARUC notes that simple kWh comparisons may not accurately reflect the true cost of electricity to the retail customer, due to demand-side management programs now in place.

NEWS BRIEFS

JILL MINNER, Assistant Editor

Project to produce wire from superconductors

The Department of Energy's Argonne National Laboratory said it is working on a research project with Intermagnetics General Corp. (IGC) to manufacture practical lengths of wire from high-temperature superconductors. "At the end of the project we expect to achieve practical superconducting wire, 100 yards long, that can be shaped into coils for magnets and other uses," stated IGC President Carl H. Rosner. Argonne said the method used will produce the highest current density ever recorded for a short length of high-temperature superconducting wire in the U.S.—164,000 amps per square cm. at 452 F below zero. DOE will provide $1 million to Argonne and $500,000 to IGC. IGC will contribute $500,000.

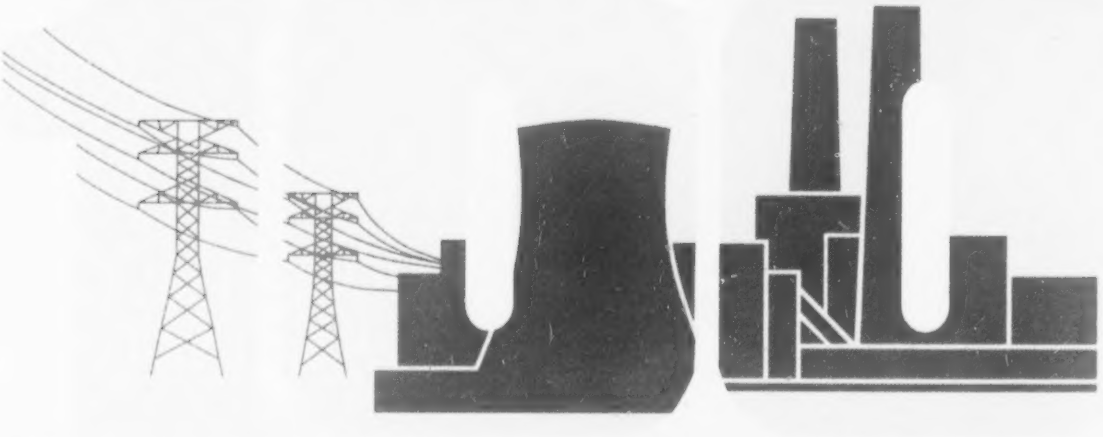
DOE to spend $50M on photovoltaic technology

The Department of Energy announced a $50-million, multi-year contract involving seven companies, to implement the second phase of the Photovoltaic Manufacturing Technology Initiative. The initiative, first announced in January 1990, is designed to overcome obstacles to improving photovoltaic manufacturing technology. DOE said the contracts will be cost shared, with DOE providing $30 million and industry contributing $20 million. The companies involved are: Astropower Inc., ECD Inc., Entech Inc., Mobil Solar, Siemens Solar Industries, Solarex Corp., and Utility Power Group Advanced Photovoltaic Industries.

Spanish utilities order replacement generators

Spanish utilities selected a new consortium formed by Framatome S.A. and Siemens AG to supply 12 replacement steam generators for four nuclear units at two plants. Central Nuclear de Almaraz and Asociacion Nuclear Asco selected the $237.5 million of components to be installed 1995-97 at Asco 1,2 and Almaraz 1,2. Three years of manufacturing will follow Siemens' design at Equipos Nucleares S.A., a Santander, Spain, company. The project is 60-percent local.

THE TOP 100 ELECTRIC UTILITIES



1992 FINANCIAL PERFORMANCES

Net income reverses 3-year slide

Mark T. Hoske
News Editor

Net income for the 100 largest investor-owned utilities increased 4-percent in 1991, stopping a three-year decline. The Top 100 also earned a record amount of revenue, gaining 4.5 percent over 1990. These gains came despite a slower, 1.1-percent gain in kilowatthour sales.

Table 1. Top 10 in Electric Customers

Rank '91	Rank '90	Company	Customers	% Change '90-91
1	1	Pacific Gas & Electric (C)	4,257,145	1.44
2	2	SCEcorp	4,078,559	1.16
3	3	Southern Company (H)	3,328,000	1.37
4	5	FPL Group (H)	3,263,370	1.72
5	4	Commonwealth Edison	3,249,178	0.96
6	6	Consolidated Edison (C)	2,943,283	0.22
7	7	American Electric Power (H)	2,774,398	1.00
8	8	Texas Utilities (H)	2,176,798	1.14
9	9	Detroit Edison	1,941,887	0.75
10	11	General Public Utilities (H)	1,878,688	0.86

Source: *EL&P* Top 100 Financial.

Less-adverse regulatory decisions, not-so-severe write-downs, and improved cost controls contributed to the improvements.

Top 100 sales data

Total sales for the Top 100 utilities in 1991 amounted to 2,358,559 GWh, up 1.1 percent from 2,332,991 GWh in 1990. Mild fall-winter weather and continued recession in many regions continued to slow sales growth. The Top 10 in sales ranked the same in 1991 as in 1990.

Over five years, 1986-91, total kilowatthour sales gained a total of 16.1 percent.

Average residential use was 9,378 kWh, up 2.9 percent from 9,118 kWh. The 1991 figure marks an all-time high for the Top 100 residential use, surpassing the previous record of 9358 kWh in 1988.

As usual, companies' with highest use were in regions with historically inexpensive hydropower and/or heavy concentrations of residential electric heat.

The average residential electric bill for the Top 100 would have been $62.75 in 1991, using the Edison Electric Institute 1991 average U.S. electricity price of 8.03 per kWh.

Customers, electric, gas

Total electric customers in 1991 numbered 84,272,415, up 1.3 percent from 83,187,704. Of the Top 100, 47 were combination utilities with both electric and natural gas service. The number of natural gas customers increased 2.1 percent to a total of 19,216,536.

Table 2. Top 10 in Electric Customers % Increase

Rank '91	Company	Customers	% Gain '90-91
1	UtiliCorp United (C)	402,135	56.30
2	Nevada Power	366,325	5.28
3	Central Louisiana Electric	211,332	4.74
4	Hawaiian Electric (H)	357,046	3.07
5	Puget Sound Power & Light	767,596	2.96
6	Central Vermont Public Service	141,972	2.92
7	Citizens Utilities (C	93,492	2.80
8	Portland General (H)	599,620	2.67
9	Sierra Pacific Power (C)	245,137	2.38
10	Pinnacle West Capital (H)	620,402	2.27

Source: *EL&P* Top 100 Financial.

Table 3. Top 10 in Revenue

Rank '91	Rank '90	Company	Revenue ($ millions)	% Change '90-91
1	1	Pacific Gas & Electric (C)	9,778	3.25
2	2	Southern Company (H)	8,050	-0.04
3	3	SCEcorp	7,502	4.22
4	6	Commonwealth Edison	6,276	18.17
5	5	Consolidated Edison (C)	5,873	2.34
6	4	FPL Group (H)	5,249	3.23
7	8	Public Service Enterprise Group (H,C)	5,093	6.11
8	7	American Electric Power (H)	5,047	-2.53
9	9	Texas Utilities (H)	4,893	7.72
10	10	Houston Industries (H)	4,444	6.35

Source: *EL&P* Top 100 Financial.

Changes in the Top 10 for electric customers reflect demographic trends (table 1). Companies with territories that serve shrinking cities—such as Chicago, Detroit and New York City—gained less than 1 percent in electric customers. Like shifts in U.S. population, several utilities serving the South and West widened their leads.

The 10 fastest growing companies, in percentage increase of customers, was led by UtiliCorp, resulting from acquisition (table 2). Most other companies in table 2 represent faster growing areas of the country.

Revenue posts a new high

Revenue was $178.2 billion, a new high for Top 100 revenue, up 4.5 percent from $170.5 billion in 1990. Revenue includes electric, gas, and steam sales, and non-regulated businesses, where applicable.

Although FPL Group led Commonwealth Edison and Consolidated Edison in total electric customers, both Edisons outpaced FPL in revenue (table 3). ComEd and FPL flipped places in rank in the Top 10 from 1990 to 1991, as did PSE&G and AEP.

Net income, earnings per share

Net income gained 4.0 percent to $15.0 billion, up from $14.4 billion. This reversed a three-year decline in net income, but was still below the record net income of $16.7 billion for the Top 100 of 1984. Continued cost-cutting efforts by utilities contributed to the improvement in 1991, along with fewer adverse rate decisions. Sixty-seven companies showed larger 1991 net income than in 1990. Also, eight companies showed net income losses in 1990, but only five did in 1991.

Average earnings per share (EPS) for the group was $2.00, up 4.7 percent from $1.91 in 1990. Sixty-two showed higher 1991 EPS than in 1990.

Utilities recovering from rough financial times or large write-offs led the pack in EPS gain (financial table). Some at the bottom showed a large one-

Continued on next page

Table 4. Top 10 Earnings Per Share

Rank '91	Rank '90	Company	Earnings Per Share $	% Change '90-91
1	4	Carolina Power & Light	4.53	3.90
2	3	Dominion Resources (H)	4.41	0.68
3	8	Pennsylvania Power & Light	4.01	1.52
4	5	LG&E Energy (H,C)	3.88	-10.44
5	9	Central Louisiana Electric	3.84	3.78
6	12	United Illuminating	3.67	3.38
7	18	Detroit Edison	3.64	11.66
8	10	Allegheny Power System (H)	3.61	0.00
9	14	San Diego Gas & Electric (C)	3.53	0.28
10	22	Atlantic Energy (H)	3.49	15.56

Source: *EL&P* Top 100 Financial.

1991 Electric Utility Sales

Company	Rank	Sales (kWh in millions)	90-91 % Change	86-91 % Change	Average Residential Use, kWh
Southern Company (H)	1	143,027	-1.42	1.05	11,659
American Electric Power (H)	2	112,639	-6.18	5.03	11,302
Texas Utilities (H)	3	82,358	-1.64	9.44	14,099
Commonwealth Edison	4	78,601	1.23	20.07	7,333
Pacific Gas & Electric (C)	5	74,196	0.19	19.99	6,421
SCEcorp	6	71,146	-0.66	10.82	6,060
Duke Power	7	69,887	2.66	15.49	12,710
FPL Group (H)	8	67,646	3.02	25.34	12,083
Entergy (H,C)	9	64,208	3.45	11.07	12,172
Houston Industries (H)	10	60,201	1.06	11.47	13,791
Dominion Resources (H)	11	58,501	6.80	17.80	12,772
Allegheny Power System (H)	12	54,545	-4.88	31.82	10,316
Central & South West (H)	13	51,775	3.52	13.10	11,413
PacifiCorp	14	51,021	2.67	105.66	10,464
Detroit Edison	15	46,583	-11.09	12.81	6,929
General Public Utilities (H)	16	43,141	1.96	22.38	8,374
Carolina Power & Light	17	40,995	3.03	14.72	12,472
Philadelphia Electric (C)	18	38,246	11.47	31.96	7,801
Public Service Enterprise Group (H,C)	19	37,849	3.07	13.67	6,504
Northern States Power (C)	20	37,425	2.29	26.32	8,001
Niagara Mohawk Power (C)	21	36,738	3.36	6.96	7,487
Pennsylvania Power & Light	22	36,219	1.45	18.02	10,101
Consolidated Edison (C)	23	35,890	1.17	18.97	4,116
Ohio Edison	24	31,713	-1.28	9.37	8,498
Union Electric (C)	25	31,610	3.83	11.87	11,106
CMS Energy (H,C)	26	30,692	3.44	9.70	7,269
Centerior Energy (H)	27	29,475	1.19	15.85	7,410
Northeast Utilities (H)	28	29,300	-1.05	6.41	8,285
Gulf States Utilities (C)	29	29,069	0.38	7.87	13,786
Florida Progress (H)	30	27,350	0.78	18.04	12,257
PSI Resources (H)	31	27,185	3.06	15.68	12,039
Baltimore Gas & Electric (C)	32	26,678	4.76	5.67	10,799
Wisconsin Energy (H)	33	25,016	5.75	31.99	8,067
Potomac Electric Power	34	24,796	3.61	19.43	11,163
New England Electric (H)	35	23,499	4.16	20.06	6,729
Oklahoma Gas & Electric	36	22,082	8.12	20.01	11,587
Cincinnati Gas & Electric (C)	37	21,013	-4.51	27.84	11,678
Public Service of Colorado (C)	38	20,452	1.51	14.08	6,563
Puget Sound Power & Light	39	20,183	3.12	24.45	13,217
Pinnacle West Capital (H)	40	19,986	1.06	44.17	10,941
Portland General (H)	41	19,654	-0.92	11.75	12,582
New York State Electric & Gas (C)	42	18,173	1.26	18.38	7,672
Southwestern Public Service	43	17,772	-2.24	7.95	8,377
Long Island Lighting (C)	44	16,411	0.16	12.12	7,812
SCANA (H,C)	45	15,755	-0.22	9.75	13,246
Illinois Power (C)	46	15,712	2.81	7.03	9,355
San Diego Gas & Electric (C)	47	14,888	-1.34	26.98	5,401
DQE (H)	48	14,840	9.73	17.73	6,331
KU Energy (H)	49	14,731	8.42	26.90	12,471
Boston Edison	50	14,139	-1.22	14.03	6,063
NIPSCO Industries (H,C)	51	13,679	2.64	22.83	7,591
Midwest Resources (H,C)	52	13,581	4.07	7.91	7,895
TECO Energy (H)	53	13,455	0.14	19.12	13,253
Idaho Power	54	13,358	3.07	-4.61	14,845
DPL (H,C)	55	13,315	5.44	5.81	11,213
Kansas City Power & Light	56	13,107	-4.98	5.39	9,959
IPALCO Enterprises (H)	57	12,246	2.51	12.00	11,460
LG&E Energy (H,C)	58	12,071	4.26	40.28	11,181
Delmarva Power & Light (C)	59	11,441	3.25	24.29	9,843
Washington Water Power (C)	60	10,577	-0.06	21.90	13,800
CIPSCO (H,C)	61	10,408	-3.06	11.42	9,904
Minnesota Power (C)	62	10,001	-2.63	34.47	8,450
IES Industries (H,C)	63	9,982	8.95	17.36	8,555
WPL Holdings (H,C)	64	9,969	4.66	14.39	9,015
Montana Power (C)	65	9,769	10.40	15.18	8,808
Wisconsin Public Service (C)	66	9,568	3.02	23.10	7,846
Nevada Power	67	9,552	3.58	42.37	13,107
KPL Gas Service (C)	68	9,538	4.48	11.66	9,616
Central Maine Power	69	9,106	-1.16	11.90	6,751
Kansas Gas & Electric	70	8,657	-3.14	14.26	10,219
Public Service of New Mexico (C)	71	8,231	14.83	22.34	6,139
Hawaiian Electric (H)	72	8,154	2.33	20.72	7,427
Tucson Electric Power	73	7,984	-0.02	24.86	8,534
Atlantic Energy (H)	74	7,936	2.31	21.70	8,440
Rochester Gas & Electric (C)	75	7,474	-3.07	11.53	7,015
Commonwealth Energy System (H,C)	76	7,368	7.18	22.88	8,181
UtiliCorp United (C)	77	7,072	16.39	146.67	9,708
Iowa-Illinois Gas & Electric (C)	78	6,487	0.41	-5.96	7,404
TNP Enterprises (H)	79	6,416	-0.08	-0.91	11,584
Eastern Utilities Associates (H)	80	6,180	5.62	32.50	6,177
Sierra Pacific Power (C)	81	5,929	2.35	47.72	7,452
Central Louisiana Electric	82	5,758	2.15	12.26	12,974
Central Hudson Gas & Electric (C)	83	5,740	0.90	15.87	6,933
Southern Indiana Gas & Electric (C)	84	5,721	2.96	28.31	12,256
CILCORP (H,C)	85	5,628	6.27	15.95	10,052
United Illuminating	86	5,234	0.57	6.54	6,756
Interstate Power (C)	87	4,803	6.17	23.48	8,145
Orange & Rockland Utilities (C)	88	4,230	4.34	23.36	7,288
Otter Tail Power	89	3,617	7.52	19.82	10,497
Empire District Electric	90	3,234	-0.34	10.65	11,437
Central Vermont Public Service	91	3,175	10.98	19.88	7,647
Madison Gas & Electric (C)	92	2,367	4.41	20.79	6,960
MDU Resources Group (H,C)	93	2,209	4.90	18.31	8,017
Green Mountain Power	94	2,190	-6.67	24.58	8,306
Bangor Hydro-Electric	95	1,566	-1.91	11.33	6,292
St Joseph Light & Power (C)	96	1,394	4.31	21.88	10,600
Citizens Utilities (C)	97	1,347	5.08	41.29	7,068
Northwestern Public Service (C)	98	1,071	3.38	18.94	8,853
UNITIL (H)	99	881	-0.81	-0.92	7,124
Upper Peninsula Energy (H)	100	787	1.39	5.04	6,117

(H) = Holding company (C) = Combination electric & natural gas utility Source: *EL&P* 27th Annual Top 100 Financial Survey.

time gain in 1990. Net income percentage change showed similar results.

While companies among the highest in earnings per share (table 4) represent some traditionally solid utilities, this measure depends somewhat on internal company policy. EPS relies partly on the number of common shares outstanding. For example, Central & South West might have been included in the Top 10 in EPS were it not for a two-for-one stock split.

Price per share

The price per average common share had a 1991 high of $32.31, and an average annual low of $24.24 (no data for TNP, Interstate, or UNITIL).

Of the total 1991 sales of 2,358,559 GWh:

- Residential sales accounted for 686,352 GWh, or 29.1 percent.
- Commercial sales, 609,372 GWh, 25.8 percent.
- Industrial sales, 689,264 GWh, 29.2 percent.
- All other sales, 373,572 GWh, 15.8 percent.

This sales mix was nearly unchanged from 1990.

Holding companies

Forty-one out of the Top 100 had a holding company structure, although most operate under guidelines that allow an exemption from the strict rules of the Public Utility Holding Company Act of 1935. Legislation is being considered to revise PUHCA.

Improvements in this year's results might anticipate a more competitive industry that legislation might create and prepare the Top 100 for the next baseload construction cycle.

Watch for the *EL&P* Top 100 Operating report in September.

Comparisons, 1990-91

In the tables and text, Top 100 data from 1986, 1990, and 1991 represent the same companies. Comparisons to data from previous *EL&P* Top 100 reports had a slightly different base of companies, primarily due to mergers and acquisitions. Multiple-year trends provide a general look at the industry's top investor-owned companies.

El Paso Electric and Public Service Co. of New Hampshire represent two of the largest differences. EPE, in Chapter 11 proceedings, could not provide figures in time to be included in this year's report.

Public Service Co. New Hampshire, with pending merger with Northeast Utilities, could not provide complete information so was not given a partial listing this year, as it was last year. PSNH, if ranked, would have been 60th in sales at 11,377 GWh. If NU acquisition is successful, it could boost NU from 28th to 16th in 1992 sales.

Notes to tables

The largest companies in total kilowatthour sales have made up *EL&P*'s Top 100 over the past 27 years.

1992 FINANCIAL PERFORMANCES

Regulators increasingly have provided incentives to promote efficiency. While this has slowed demand growth in some areas, it cannot, with present investment, replace the need for new baseload generation.

Offsetting greater investments in efficiency are growth of environmentally beneficial electric technologies. In some applications, electricity can be the best choice to replace other, less clean, forms of energy.

Given these opposing trends, *EL&P* continues to use total electric sales to determine the Top 100.

Some of the more significant financial footnotes follow, especially certain one-time changes. See individual company results for detailed explanations.

Alphabetically, by utility:

CMS Energy, despite a loss in EPS, showed a significant percentage gain over an even greater loss in 1990.

Eastern Utilities Associates rebounded from a 1990 write-off and loss from a subsidiary.

FPL Group's large percentage gain reflected a 1990 loss due to a charge for deposition of certain subsidiaries.

Gulf States showed higher results after a 1990 EPS loss.

KU Energy figures reflected formation of holding company in 1991.

LG&E Energy's lower earnings per share resulted in part from an accounting change in 1990.

New England Electric System showed a one-time increase in 1990 results related to Seabrook.

Public Service Co. of New Mexico posted a gain from a 1990 loss.

SCANA 1990 results showed a one-time gain from a property sale.

Sierra Pacific showed lower 1990 results due to an abandoned project.

Southern Company posted a five-year EPS high of $3.11 in 1986.

Pinnacle West 1991 results showed the costs of discontinued operations and charges related to Palo Verde.

Washington Water Power acquired a gas property in 1991.

Name changes, more on Top 100

KPL Gas Service applied for a name change to Western Resources, after completing purchase of KG&E in April. Kentucky Utilities formed a holding company, KU Energy. Southern California Edison is reported under its parent, SCEcorp.

With mergers and acquisitions, the Top 100 has come to include more operating companies. The corporate structure of the Top 100 now represents approximately 150 utility entities. A breakdown is available on "*EL&P* Electric Power Generation and Transmission Systems Map of the U.S.," from PennWell Maps; call (800) 752-9764.

EL&P's Top 100 data will be available on disk for further analysis; call (800) 345-4618 for more information.

EL&P's Dianne Wilson and Judy Sisk helped gather data for this report from more than 100 U.S. investor-owned utilities.

1991 Utility Financial Performance

Company	Revenues ($1000)	Net Income ($1000)	% Change in Net Income	Earnings Per Share,$	% Change in Earnings Per Share	Rank
Sierra Pacific Power (C)	468,766	41,946	435.85	1.75	400.00	1
Niagara Mohawk Power (C)	3,382,518	159,406	292.84	1.49	396.67	2
Philadelphia Electric (C)	3,975,837	468,576	278.28	2.15	270.69	3
Public Service of New Mexico (C)	857,168	13,486	241.07	0.32	239.13	4
Delmarva Power & Light (C)	844,807	83,981	3.92	1.69	181.67	5
Illinois Power (C)	1,474,905	78,378	167.96	1.04	167.97	6
FPL Group (H)	5,249,436	240,578	161.53	1.48	151.75	7
Gulf States Utilities (C)	1,702,235	102,283	330.98	0.34	134.34	8
Eastern Utilities Associates (H)	523,593	27,632	121.74	1.58	119.32	9
Southern Company (H)	8,050,000	964,000	36.86	2.78	45.56	10
CMS Energy (H,C)	2,940,949	(265,364)	48.63	-3.44	43.33	11
MDU Resources Group (H,C)	267,342	18,937	11.50	1.96	37.06	12
Nevada Power	538,775	35,176	40.75	1.05	34.62	13
Houston Industries (H)	4,443,739	417,383	22.96	3.28	22.85	14
TNP Enterprises (H)	441,343	18,455	21.92	2.23	21.20	15
Baltimore Gas & Electric (C)	2,352,720	253,426	18.87	2.51	19.52	16
Hawaiian Electric (H)	1,083,841	54,826	25.74	2.40	18.81	17
CILCORP (H,C)	590,165	40,484	11.39	3.14	16.73	18
Northern States Power (C)	2,201,158	206,053	16.22	3.29	16.25	19
Atlantic Energy (H)	777,970	102,046	28.07	3.49	15.56	20
Potomac Electric Power	1,552,066	197,866	23.95	1.87	15.43	21
Madison Gas & Electric (C)	232,200	24,880	12.94	2.28	11.76	22
Detroit Edison	3,591,537	535,205	11.67	3.64	11.66	23
DQE (H)	1,199,468	133,565	9.77	2.50	11.61	24
Wisconsin Public Service (C)	623,499	54,172	10.50	2.23	11.50	25
Interstate Power (C)	290,357	29,510	9.19	2.84	10.94	26
Montana Power (C)	938,934	105,715	11.30	2.03	10.33	27
CIPSCO (H,C)	722,081	77,461	8.53	2.11	9.90	28
Union Electric (C)	2,096,940	307,453	9.99	3.01	9.85	29
Northeast Utilities (H)	2,753,803	236,709	12.18	2.12	9.28	30
WPL Holdings (H,C)	648,801	64,934	9.06	2.43	8.97	31
Midwest Resources (H,C)	1,024,944	68,444	9.86	1.36	8.80	32
Duke Power	3,816,960	583,623	8.44	2.60	8.33	33
Central Maine Power	874,732	53,655	18.86	1.82	8.33	34
Entergy (H,C)	4,051,429	482,032	0.78	2.64	8.20	35
KU Energy (H)	587,660	80,587	8.03	2.13	8.12	36
Otter Tail Power	179,660	26,096	5.01	2.15	8.04	37
Upper Peninsula Energy (H)	60,475	4,454	8.05	2.96	7.25	38
NIPSCO Industries (H,C)	1,536,161	130,325	4.19	1.94	7.18	39
KPL Gas Service (C)	1,162,178	83,268	6.93	2.41	7.11	40
Green Mountain Power	143,555	9,604	12.39	2.45	6.99	41
Pacific Gas & Electric (C)	9,778,119	1,026,392	3.97	2.24	6.67	42
Citizens Utilities (C)	547,588	112,354	6.37	2.06	6.19	43
IPALCO Enterprises (H)	647,873	101,998	5.22	2.72	5.43	44
Central & South West (H)	3,048,000	375,000	5.34	1.99	5.29	45
UtiliCorp United (C)	1,075,200	73,500	24.79	2.23	4.69	46
Southern Indiana Gas & Electric (C)	326,490	37,232	2.26	3.16	4.64	47
TECO Energy (H)	1,154,078	145,300	4.26	2.55	4.08	48
Carolina Power & Light	2,685,755	364,380	0.74	4.53	3.90	49
Minnesota Power (C)	484,144	74,675	6.65	2.46	3.80	50
Central Louisiana Electric	337,338	44,929	5.61	3.84	3.78	51
United Illuminating	673,371	55,550	2.78	3.67	3.38	52
Puget Sound Power & Light	956,769	132,777	0.33	2.21	2.31	53
Central Vermont Public Service	233,469	18,576	5.96	2.48	2.06	54
American Electric Power (H)	5,046,611	497,935	0.31	2.70	1.95	55
Kansas City Power & Light	825,101	103,893	1.13	3.16	1.61	56
Pennsylvania Power & Light	2,557,874	348,414	1.31	4.01	1.52	57
Wisconsin Energy (H)	1,538,915	189,307	1.38	2.81	1.44	58
Central Hudson Gas & Electric (C)	494,736	42,941	4.64	2.40	0.84	59
Dominion Resources (H)	3,785,700	459,900	3.19	4.41	0.68	60
PacifiCorp	2,250,640	479,994	6.24	1.86	0.54	61
San Diego Gas & Electric (C)	1,789,012	197,525	0.28	3.53	0.28	62
Allegheny Power System (H)	2,282,167	212,575	1.27	3.61	0.00	63
Florida Progress (H)	2,074,700	172,100	4.43	3.20	-0.31	64
Public Service of Colorado (C)	1,794,904	137,459	2.81	2.48	-0.40	65
General Public Utilities (H)	3,371,599	275,882	-0.85	2.49	-0.80	66
Consolidated Edison (C)	5,873,058	566,910	-0.80	2.32	-0.85	67
St Joseph Light & Power (C)	89,580	9,790	-4.16	2.44	-1.61	68
Boston Edison	1,319,714	94,670	-0.81	1.96	-2.49	69
Oklahoma Gas & Electric	1,314,770	131,599	-3.75	3.27	-3.25	70
Southwestern Public Service	725,463	107,475	-3.66	2.63	-3.66	71
Ohio Edison	2,358,946	240,069	-5.50	1.60	-4.19	72
New York State Electric & Gas (C)	1,555,815	148,313	2.04	2.36	-4.84	73
Public Service Enterprise Group (H,C)	5,093,210	544,251	0.36	2.43	-5.08	74
Iowa-Illinois Gas & Electric (C)	512,537	54,367	-2.02	1.86	-6.53	75
Rochester Gas & Electric (C)	853,270	67,997	3.15	1.60	-6.98	76
Empire District Electric	150,441	18,768	-0.23	2.86	-8.33	77
Long Island Lighting (C)	2,548,850	239,144	-9.12	2.15	-8.90	78
Centerior Energy (H)	2,560,252	237,240	-10.29	1.71	-10.00	79
LG&E Energy (H,C)	714,965	82,951	-9.27	3.86	-10.04	80
SCEcorp	7,502,498	702,605	-10.65	3.21	-10.83	81
Orange & Rockland Utilities (C)	579,842	44,868	-9.97	3.12	-11.86	82
Bangor Hydro-Electric	146,508	6,585	-2.53	1.33	-12.50	83
UNITIL (H)	87,986	1,778	-13.69	2.48	-14.78	84
Kansas Gas & Electric	558,968	52,781	-16.70	1.70	-15.00	85
Northwestern Public Service (C)	122,900	14,445	-15.63	1.88	-15.70	86
Commonwealth Energy System (H,C)	849,568	18,120	-14.62	1.82	-15.74	87
Tucson Electric Power	589,265	(457,493)	-18.21	-18.10	-16.77	88
Idaho Power	483,193	57,872	-16.42	1.56	-18.32	89
Cincinnati Gas & Electric (C)	1,518,098	182,467	-14.16	3.32	-19.42	90
DPL (H,C)	1,005,491	128,951	-20.95	1.73	-22.42	91
Washington Water Power (C)	485,075	69,211	-3.15	2.68	-22.54	92
SCANA (H,C)	1,147,826	135,851	-25.19	3.37	-24.10	93
New England Electric (H)	2,094,378	179,810	-31.38	2.77	-32.60	94
IES Industries (H,C)	661,538	44,657	-44.41	1.85	-45.10	95
Commonwealth Edison	6,275,533	16,599	-63.75	0.08	-63.64	96
PSI Resources (H)	1,122,272	19,119	-83.99	0.35	-84.09	97
Texas Utilities (H)	4,893,173	(409,964)	-148.19	-1.98	-145.00	98
Portland General (H)	889,935	(49,867)	-149.89	-1.06	-148.85	99
Pinnacle West Capital (H)	1,474,550	(321,467)	-138.80	-2.15	-291.96	100

(H) = Holding company (C) = Combination electric & natural gas utility

Source: *EL&P* 27th Annual Top 100 Financial Survey.

Manufacturers, utilities, governments combine to market electric vehicles

Mark T. Hoske, News Editor

Electric utilities, auto manufacturers, federal, state and local governments, battery researchers and coordinating groups are producing results on bringing electric vehicles (EVs) to market along with the needed infrastructure.

Despite progress, severe limitations remain.

These limitations, amplified by the conservative, cautious nature of many of the players, become more acute as environmental deadlines for vehicles near and as 11 states and the District of Columbia consider adopting California and New York mandates for EV sales. Except for California, the states are in air-quality nonattainment areas of the Northeast.

California rules may expand widely

The mandates are controversial. New York environmental regulators adopted the California standard, but the state legislature may overturn it. Manufacturers say its unclear if enough demand or interest can be created. Mandates also increase costs, they say.

GM's sporty Impact seems to be the EV with the most mass appeal...and a commercial production date. Below, as battery technology improves, so will performance. Quickness and range are tradeoffs.

California requires zero and low-emissions vehicles to be sold as a percentage of total auto sales—by 1998, 2 percent of vehicles sold must be zero-emissions (only EVs now qualify); and by 2003, 10 percent. That would translate into 35,000 EVs on the road by '98 and a total of 400,000 by '03.

Benefits: cleaner air, off-peak sales

Many utilities have supported EV development for the environmental benefits and for adding off-peak sales. Edison Electric Institute says the average EV uses 1 kWh per mile, or 10 MWh per year, based on 10,000 miles travelled. If only 10 percent of off-peak supply were available for charging, 20 million EVs could be on the U.S. grid without adding generating capacity.

EEI claims EVs cut overall emissions by 95 percent compared to gasoline vehicles, based on the present mix of U.S. generating sources.

Daunting challenges ahead

However, with deadlines approaching, daunting challenges remain, including:

- *Batteries.* Battery technology, the largest single handicap for electric cars, has progressed slowly this century. Gasoline provides 100 times more work per weight than lead-acid batteries, a Department of Energy official noted recently. Lead-acid batteries only provide 20 times more work per weight than rubber bands, he added.

Given these limits, an EV battery array carries about as much energy as a gallon or two of gasoline, allowing 60-150 miles of travel, depending on the vehicle and use. A late model internal-combustion Ford Escort has a range of about 400 miles.

While technologies are advancing, batteries are still costly and require replacement, adding thousands of dollars to EV life-cyle costs. And it might be decades before away-from-home recharging is as hassle-free as gassing up.

- *Performance.* Acceleration of most EVs is still too slow for aggressive highway driving, particularly in urban California. Quicker acceleration is technically possible, but cuts range needed for many long California commutes.
- *Comfort.* The zero emissions rule requires electric heating and air conditioning. These rapidly decrease range. Some advances have been made. For example, Electric Power Research Institute has developed air conditioning that cuts range penalty of 45 percent to 11-26 percent.
- *Price.* EVs, from major manufacturers, aren't priced for everyone. Initial price for Chrysler TE-vans is expected to be $120,000 in December, although company officials said the price will fall. Vehma International refits GM's Vandura, a full-sized Chevy van. The resulting G-Van EV sells for about $53,000. EPRI contributed to development of both.

CO_2 Reductions Through Electricity Substitutions

Transportation Mode	Electric Counterparts CO_2 Reductions
Electric Vehicle vs. Gasoline Car	43% to 54%
Electric Train vs. Diesel Train	14.89%
Electric Trolley vs. Gasoline Bus	71.86%
Electric Trolley vs. Diesel Bus	58.52%
Electric Train vs. Large Semi-Trailer Gas Truck	46.39%

Source: Edison Electric Institute

This BMW four-passenger concept EV takes 15.6 seconds to get to 50 mph, but the range is 166 miles.

- *Uncertainty.* General Motors confirmed in late April that commercial production of its prototype "Impact" sports car EV would start by January 1995. Company representatives promise the production model of Impact will rival gasoline competitors in price and performance, but gave no details.
- *Infrastructure.* Various areas of government are working on standards for plugs, voltages, recharging, and related building, electrical, and highway codes. Infrastructure includes "fueling" facilities, standards, EV maintenance, and anything else required to make EVs as desirable to own as other vehicles. Manufacturers and industry groups warn that lack of standardization is slowing the process. Some utilities and others are working on creating convenient parking/recharging areas. Solar, metering, and distribution automation technologies also will be involved.
- *Process.* John Wallace, with Ford Motor Co.'s EV program, expressed frustration at getting all participants in the process to work quickly, saying it's like "trying to get all the elephants to dance." With government, automakers, utilities, and others involved, "No one wants to make a mistake," he added. Pending legislation should help, if passed.
- *Market.* Given limitations, who's going to buy one of these? By mandating sales, rather than availability, California has guaranteed EVs will be on the road, even if automakers have to sell them for much less than manufacturing costs.

Making a market with mandates

The EV market and mandates were some of the items industry leaders discussed at the Electric Vehicle Seminar, Washington, DC, sponsored by the Electric Transportation Council and Edison Electric Institute on April 28.

Some market clearly exists, according to a recent survey for Southern California Edison. More than half of 1000 respondents favored the mandated-sales law; about half of those opposing it said they'd change their mind if tax breaks were attached to EV purchases.

Michael Peevey, Southern California Edison president, speaking at the ETC-EEI conference, gave the results of the survey. Of people saying they would purchase an EV, two-thirds said that $1000 annual costs for battery replacement wouldn't stop them.

"You can mandate all the sales you want," said J. Michael Davis of DOE, "but somebody's got to want to buy them." Davis is assistant secretary of conservation and renewable energy at the Department of Energy.

Watch for more on electric vehicle developments in future issues.

This G-Van, owned by Lower Colorado River Authority, is one of about 150 manufactured. It's often at industry shows, but with 60-mile range, and $53,000 current price, the G-Van's market seems limited.

Vibration monitoring proves itself at Clinton Power Station

Ronald L. Stiemsma
Illinois Power Co.

During the last four years, a comprehensive vibration monitoring system has been developed at Clinton Power Station. This program now includes over 204 machines and has documented over $480,000 in cost savings during its first year of implemention. The machines in the program include motors, pumps, fans, gearboxes, and diesel engines ranging in size from 5 to 6000 hp.

Before the new program began, Clinton collected some vibration data. It consisted of recordings of overall vibration data on one point of a machine. The data then was trended manually. But this technique provided no diagnostic capability and was unsuccessful in predicting many failures.

Current program

The current vibration program uses a portable data collector, a host computer, and trending/analysis software. The system's initial cost was approximately $40,000, but the investment was paid for in less than one year of service.

The largest saving in the first year came after a seal failure on a 6300-hp recirculating water pump. An analysis and monitoring program convinced the Nuclear Regulatory Commission to allow the 985-MW reactor to be brought back online two days earlier than would have been possible without the program. Savings came from the engineering and repair personnel efforts that were no longer needed for the task and the unit's beginning to earn from generation again.

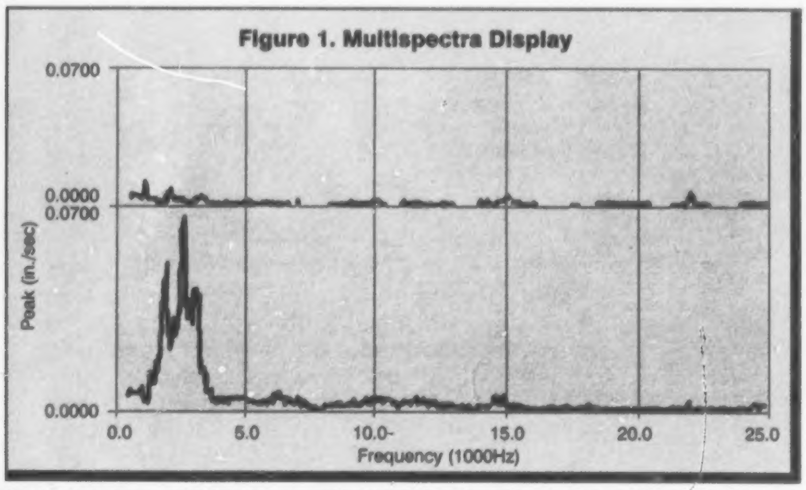


Figure 1. Multispectra Display

Graph shows the same data point on a vertical pump. The two sets of data were taken within 15 min of each other. Although there appears to be a bearing problem with this pump, the cause of the variation was the controller on the discharge valve that allowed the valve to close.

Another large saving was estimated from replacing bearings that had not yet failed on a 75-hp fan. According to the analysis, bearing failure was imminent and would have damaged the fan severely.

Clinton personnel collect vibration data at each accessible bearing location in both the horizontal and vertical directions. Axial data also is taken on each of the machine components—both the driver and driven units—for every machine in the program.

Besides trending vibration data, the program also trends other system parameters—discharge/suction pressure, motor current, etc. This has helped to identify problems that were system-related rather than a fault of the machine.

The first step in developing the vibration program was selecting the machines to be monitored. Engineers selected 32 machines for the pilot program. These were units critical to plant operation or that had a history of problems. By starting with only 32 machines, the engineeers were able to learn the many aspects of vibration monitoring without being overwhelmed by the data collection task.

This methodology also allowed for the most important and time-consuming aspect of developing the program, the initial research into the internal parts of the machines selected.

What data to collect

Some of the other data that needs to be investigated before any vibration data is collected are the number of blades on the fan or impeller, number of teeth on gears, running speeds of the machine components, and types and characteristics of the bearings (i.e., ball diameter, number of balls, pitch diameter, and contact angle). Some of this data is available from the machine manufacturers, but some is not available until a machine is inspected.

However, opening up a machine to find this information is not recommended. So, in some instances, best engineering judgement was used to fill in the missing information.

With all the information gathered, personnel began to develop the database and customize it to each machine. Although this is time-consuming, it saved many hours when performing analysis of the vibration data.

Bearing substitutions

One of the biggest problems encountered was that when a bearing needs to be replaced, it is not always replaced with the same model as the original. Many bearing manufacturers have cross references for "equivalent bearings." These bearings are equivalent in handling the design intent, but may have different physical characteristics, such as the number of balls.

These differences can completely alter the vibration signature coming from a bad bearing in the machine. Personnel at Clinton now document the type bearing installed during corrective maintenance.

An analysis and monitoring program convinced the NRC to allow the reactor back online two days earlier than it would have without the program.

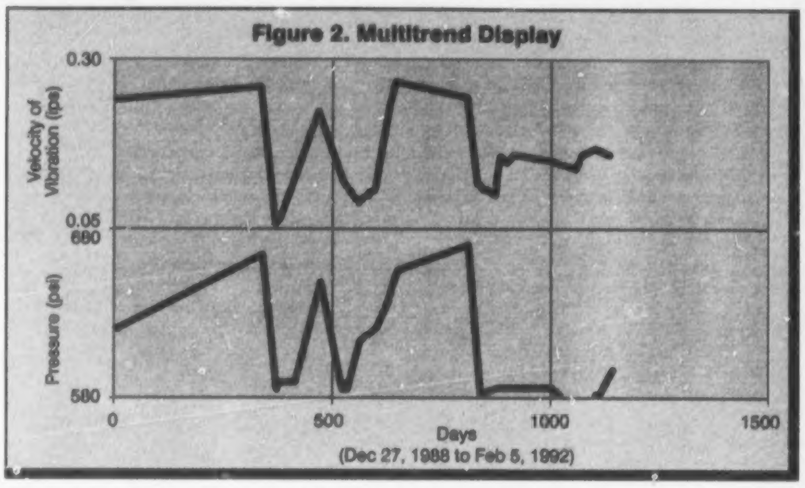


Figure 2. Multitrend Display

These curves show the clear relationship between axial pump vibration and pump discharge pressure. They indicate the importance of knowing system parameters when vibration data is collected.

Everyone adds their ideas

Engineers involved the station's maintenance group early in the program and received their support.

Although this was essential for success, it produced a problem that nearly overwhelmed the project. The maintenance group flooded the engineers with requests for assistance on many machines not scheduled to be in the program.

The requests doubled the size of the pilot program in two weeks. Because of the growth, initial research into many machines could not be done, which made the analysis much more difficult.

However, the growth also allowed the vibration program to have a greater chance of success. After starting work on the original 32 machines, with the majority in generally good condition, the implementation group was able to help diagnose many suspected problems on the additional units. Some of them were specified by maintenenace workers with comments such as, "It sounds funny." In many of these cases, however, work could be cancelled based on acceptable vibration data.

Costs vs. benefits

A cost/benefit analysis was performed after the first and second years of the program, and showed significant savings obtained. In the third year, the program did not expand much, and the majority of the monitored machines ran well. Therefore, savings were relatively small.

Although it was difficult to provide dollar amounts for "work saved" by replacing a bearing before it actually failed, maintenance history was used from similar machines that actually had failed, and these dollar amounts were used.

Comparisons showed a considerable savings from work that was cancelled based on satisfactory vibration data. To date, machines which had work cancelled due to the program have run with no problems.

New features

Process changes can greatly affect the overall vibration levels of a machine in that process (Figs. 1 and 2).

So, in the last year, Clinton added the ability to trend bearing cap temperatures along with vibration. This is done by using an infrared temperature sensor and entering the data obtained into the datalogger while collecting vibration data.

The engineers also are investigating combining the oil analysis and vibration databases to improve analysis capabilities.

Future plans

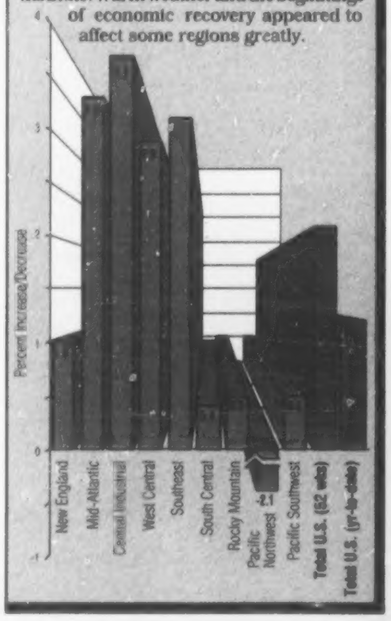
Plans for 1992 include the collection of more useful diagnostic information. Some of this additional data will be more process information, such as pressures and temperatures. Also, an overhaul plan is to be established that is even more dependent on predictive maintenance.

Engineers are working with the vibration equipment supplier to develop a smaller datalogger that could be used by area operators while they are making their rounds. They would collect local system parameters on the datalogger and download this information into a database that is similar to and communicates with the vibration database.

ELECTRIC OUTPUT

Growth Mixed

Changes in net electric output from the Mainland U.S. electric utilities continued to vary widely for the 52 weeks ending April 25, as reported by Edison Electric Institute. Warm weather and the beginnings of economic recovery appeared to affect some regions greatly.



In-duct Ca sorbents remove more SO_2 with fabric filter than with ESP

PALO ALTO, CA—In pilot-scale testing, duct injection of calcium-based sorbents upstream of a fabric filter yielded higher SO_2 removal rates than injection ahead of an electrostatic precipitator (ESP).

The Electric Power Research Institute reported that proof-of-concept tests at its Arapahoe Test Facility in Denver of dry-injection pilot-scale tests were performed with a 2000-cfm fabric filter, a 4000-cfm fabric filter, a 4000-cfm electrostatic precipitator, and EPRI's own HYPAS (hybrid pollution abatement system).

The tests assessed effects on SO_2 capture of sorbent type, approach-to-adiabatic-saturation temperature, calcium-to-sulfur ratio, inlet SO_2 concentration, steam injection, sorbent injection upstream of humidification, recycling sorbent, and residence time. Researchers looked into performance of 15 sorbents, including commercial calcitic hydrates, dolomitic hydrates, and specially prepared calcitic hydrates with a silica-enhanced sorbent.

Results and reasons

The better results obtained with the fabric filter were ascribed to increased gas/solid contact provided by the filter material.

The primary variables affecting SO_2 removal in both ESP and fabric filters were approach-to-adiabatic-saturation temperature, calcium-to-sulfur ratio, and rate of steam injection.

Gas volume flow was 2500-5000 cfm and its velocity was 1.8-3.6 fps. SO_2 concentration was 900-3000 ppm.

Using commercial calcium hydroxide, a 20°F approach-to-adiabatic-saturation temperature, and calcium-to-sulfur ratio of 2.0, SO_2 removal rates ranged from 34 to 42 percent for injection ahead of an ESP and 40 to 60 percent for injection ahead of a fabric filter. At a 40°F approach-to-adiabatic-saturation temperature and holding the other parameters constant, the results were SO_2 removal rates of 25-35 percent for the ESP and 30-38 percent for the fabric filter. The upper values in both sets of tests were obtained with 350-pph steam injection.

The HYPAS removal rates were the same as those from the baghouse configuration. However, HYPAs significantly reduced deposition of ash and sorbent in the vicinity of the humidification atomizers and the sorbent injection point. This characteristic allowed for more reliable operation at low approaches to adiabatic saturation temperatures where the duct injection process was most efficient.

Parameters that had little or no effect on SO_2 removal rates were initial SO_2 concentration, method of steam injection, and type of sorbent.

Basic concepts

In the basic process, a calcium-based sorbent is injected into the flue gas downstream of the boiler air heater, but upstream of the particulate control device. The sorbent removes SO_2 while it is in suspension in the ductwork, as well as while in suspension in the particulate collector.

Reaction byproducts and flyash are collected in the particulate control device—the electrostatic precipitator or fabric filter.

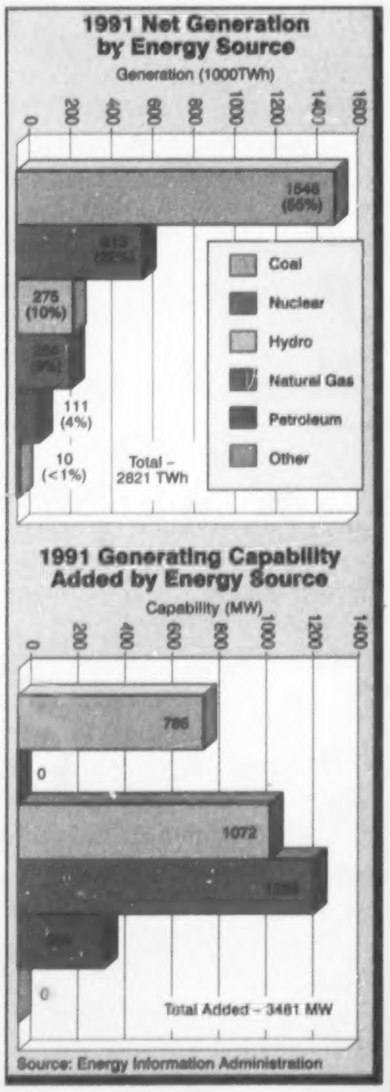
Moisture is injected upstream of the particulate control device to increase the humidity of the flue gas, a prerequisite for substantial SO_2 removal.

The ESP used is a three-field, masted frame design with a specific collection area of 450 ft^2/1000 cfm. The baghouse is a single-compartment unit containing 64 bags with an effective filtering area of 662 ft^2 and an air-to-cloth ratio of 3.0.

HYPAS concept

The HYPAS process uses a second

Continued on page 33



Source: Energy Information Administration

At UE&C we thrive on challenges.

To meet strict SO_2 and NO_x challenges without disrupting your plant output or your bottom line, turn to UE&C.

The deadline for Phase II of the Clean Air Act is January 1, 2000. But now is the time to start taking action if your plant is targeted for emissions reduction.

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VOICE OF THE ELECTRIC UTILITY INDUSTRY

LATE NEWS

New Orleans-based Entergy, with four electric utilities, offered $2.3 billion for Gulf States Power Co. Gulf States, based in Beaumont, TX, has been facing financial and legal challenges related to the River Bend nuclear plant.

Yankee Rowe operators cite higher decommissioning costs, in-part from lack of high-level nuclear waste storage, as reason for seeking a $28-million annual rate hike until 2000. Other utilities may need to refigure how much to set aside for decommissioning.

Energy bill nears enactment

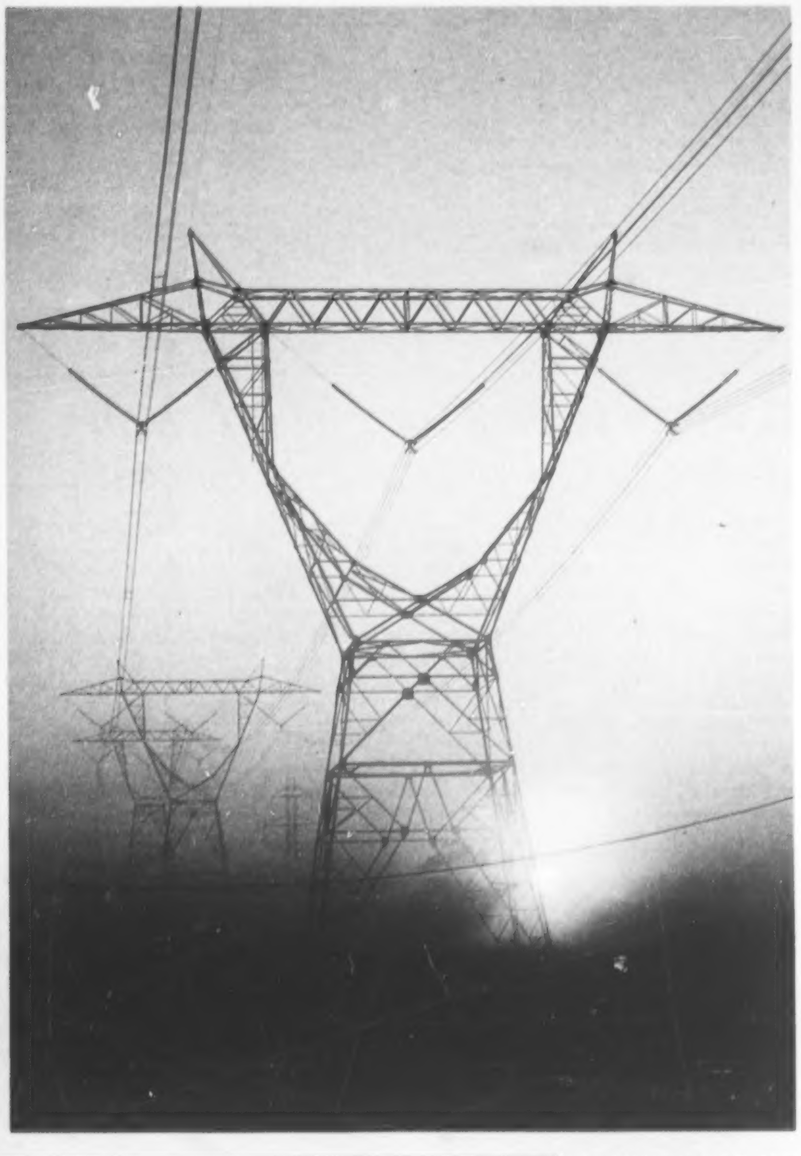
WASHINGTON—By the Fourth of July, Congress could send a national energy bill to the president's desk, including reform of utility holding company law and nuclear licensing.

Major issues in the conference committee are likely to include transmission-access provisions.

Bills passed

The House passed its energy bill, HR 776, on May 27. The Senate passed its version in February. Both exclude auto efficiency standards and added Arctic oil exploration, which were too controversial to allow the package to pass.

Among the most wide-sweeping changes for utilities are reform to the Public Utility Holding Company Act of 1935 (PUHCA), the nuclear licensing procedures, and limits to Nevada's power to slow site characterization for a high-level nuclear waste repository at Yucca Mountain.



Legislation seems likely to bring a new dawn of competitiveness among electric utilities. Access to transmission lines has been a major point of contention. (Photo courtesy of American Electric Power.)

The language on nuclear licensing adopted in the House bill was the same as in the Senate legislation, S.2166, passed Feb. 19 (*EL&P*, 3/92, 4/92, p.1). The House bill includes tax provisions to promote demand-side management, and electric vehicles, and renewable energy. Both advance efficiency.

Nuclear license, transmission access

Because the House essentially accepted the Senate language on nuclear power, the conference committee may have to be more flexible about House transmission-access provisions. Access, without retail wheeling, was in the House legislation, but not in Senate language.

Historically, utilities without ownership interest in transmission lines argue that owners discourage others from using those facilities. Some investor-owned utilities have tried to offer more open-access arrangements, with mixed results. Large customers, independent power producers, and municipal utilities generally support open access.

Although President Bush has said he would veto unfavorable legislation, a compromise bill the administration can sign seems likely.

Administration is pleased

Linda Stuntz, deputy secretary of the U.S. Department of Energy, told the recent annual meeting of the Edison Electric Institute that DOE is happy with Congress' progress on federal energy legislation.

"We have a good bill from the Senate and a workable bill from the House." She said DOE was particularly pleased with the nuclear licensing provisions of the House bill: "It's terrific." House agreement with the Senate takes this issue "essentially off the table."

Stuntz said it's possible that the bill could be completed in a conference committee and sent to the president for signature prior to the July 4 recess.

Targets for change

DOE's priorities for the conference committee include eliminating the provisions in the House bill restricting oil drilling on the Outer Continental Shelf, cutting back "burdensome" provisions in the House bill on hydropower licensing, and making sure that PUHCA reform doesn't include mandatory transmission access.

DOE favors only voluntary transmission access agreements with no federal mandates, and opposes retail wheeling. DOE, Stuntz said, is "enthusiastic" about voluntary regional transmission access agreements. The problem, she added, is how to translate that into concrete legislative proposals.

Stuntz said a key issue in the conference access debate will be FERC's power to order construction of new transmission lines in order to facilitate more

Continued on page 3

EPA issues final WEPCo rule

WASHINGTON—The Environmental Protection Agency issued a final rule in mid-June on environmental regulation of power plant modifications—the so-called "WEPCo rule." The rule resolves a four-year dispute between EPA and utilities and may spur delayed projects.

EPA says the rule "would exclude pollution-control projects at electric utility power plants from 'new source review' unless EPA determines that the projects would not be environmentally beneficial. In addition, other physical and operation changes, apart from pollution-control projects, will also be excluded from 'new source review' unless they cause an increase in actual emissions."

Uncertainties started in 1988

The dispute surfaced in 1988 when EPA required Wisconsin Electric Power Co. to subject its 40-year old Port Washington station to a 'new source' environmental review because a proposed life extension increased the station's potential to emit pollutants. Retrofit pollution control equipment required by EPA as a result of the review doubled the cost of the project.

WEPCo and EPA reached agreement and the utility proceeded with the Port Washington project, but the precedent-setting ruling killed the fossil power plant life extension trend, primarily because there were no published guidelines for evaluating existing plant modification projects.

Asked about the new rule, WEPCo CEO Richard Abdoo said, "We can live with it." He said the new rule would have resulted in the same amount of environmental retrofit costs at the Port Washington project as the original EPA ruling, but publication of the rule allows utilities to accurately estimate the added costs in advance.

Abdoo said the modifications to the first unit at Port Washington are complete and the rest of the project is proceeding on schedule.

DOE calls rule good, reasonable

Linda Stuntz, deputy secretary of the Department of Energy, which opposed EPA on the WEPCo rule issue, said, "I'm glad it finally got done. It's too bad it took so long." She said she feels the final rule is a good rule and allows for reasonable maintenance of older plants.

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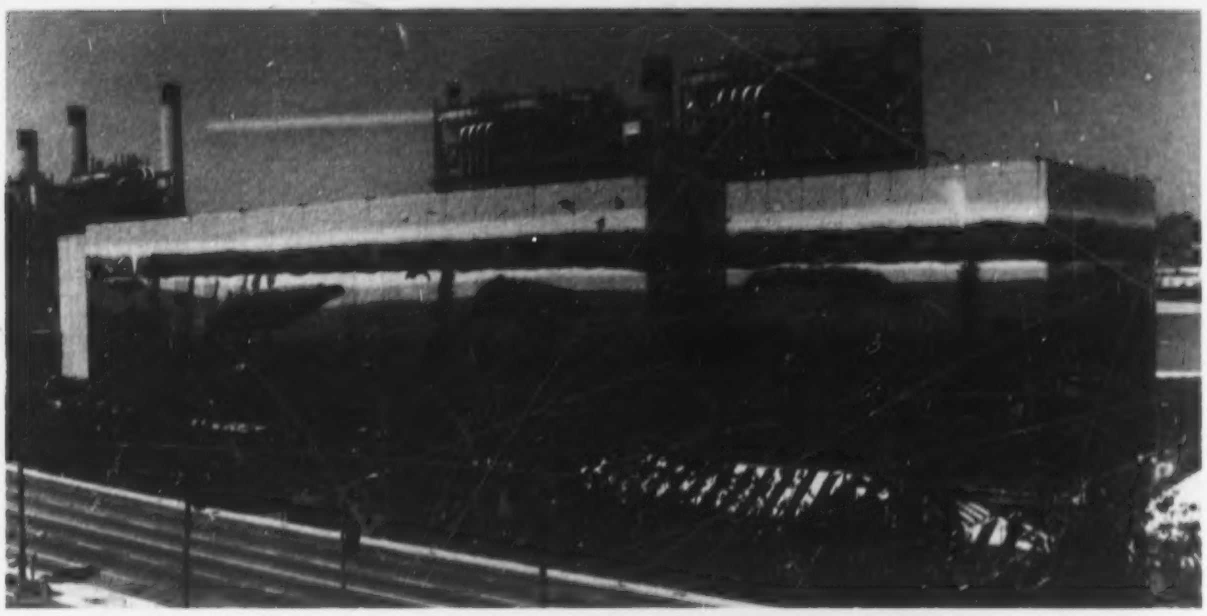

Lifesized wall of whales brings record SCE publicity

A year after Southern California Edison's Whaling Wall XXXI was dedicated as the largest lighted mural in the world, the company reports over 1450 positive "media hits" and improved business and community relations. The 10-story by 622-ft mural covers part of the wall around SCE's 88-year-old Redondo Beach plant, now located in a residential/light commercial area. "It's an overpowering scene that's really become a point of interest and pride for the community," said SCE spokesperson Robert Goodlow. The wall brought record publicity to the company, he added. The mural, by environmental artist Wyland, shows 12 life-sized gray and blue whales and other marine life. More than 10,000 people were involved, including the Redondo Beach Chamber of Commerce. SCE did three media kits and two video releases related to the wall and accompanying events. SCE also helps operate a marine education facility adjacent to the site. Since 1977, SCE has spent over $3.5 million for noise reduction at the 1500-MW, natural gas-fired plant.

Northeast Utilities completes PSNH purchase

MANCHESTER, NH—After more than four years of uncertainty for Public Service Co. of New Hampshire, Northeast Utilities completed its $2.3-billion acquisition.

PSNH, burdened by construction and litigation delays at the Seabrook nuclear plant, filed for Chapter 11 Bankruptcy Protection in January 1988, after about six years of financial difficulties. NU's newly formed North Atlantic Energy Corp. subsidiary now owns PSNH's 35.6-percent share of Seabrook.

NU is the plant's new majority owner. It started full-power operation in August 1990.

PSNH emerged from bankruptcy protection in May 1991 under agreement that it would be acquired by NU.

Best offer

NU gave PSNH the best offer, which will save nearly $1 billion for customers of both systems, NU said. New England Electric Systems also bid for PSNH.

Merger approvals and debate ignited transmission access and wheeling controversy throughout the industry.

The Federal Energy Regulatory Commission chose to refine its case-by-case transmission policy with its approval of the transaction. FERC made and revised its conditional approval by offering others more access to the now larger NU grid. Provisions exist not to deprive NU customers of savings from economy exchanges if others are fully using the system.

Identity maintained

Despite some merger consolidation and change in management staff, NU has tried to maintain PSNH's identity. An NU announcement used the word "affiliation," rather than acquisition, even though PSNH will operate as a wholly-owned subsidiary.

NU will also maintain a separate PSNH president and board of directors based in Manchester, NH. PSNH also will be operated more autonomously than three other NU electric utility subsidiaries, said William B. Ellis, NU chairman and chief executive officer. The NU board added two New Hampshire residents.

Other operators

Other NU operating utilities are Connecticut Light & Power Co., Holyoke Water Power Co., and Western Massachusetts Electric Co.

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Interest glows for new, efficient bulb

COLUMBUS, OH—A versatile, high-efficiency bulb will help demand-side management efforts starting early 1993, according to a manufacturer and American Electric Power.

The "E-Lamp," by Intersource Technologies, uses radio waves instead of a filament or electric current. Intersource has $6.5 million in support from AEP, which bought part of the company.

The bulb, introduced at the Edison Electric Institute annual meeting, received wide media coverage, including extensive play in *The New York Times*, *Wall Street Journal*, other major papers, and newswires.

AEP's Catherine Ferrari said interest has remained high since the June 1 announcement.

Widespread interest

"We've been flooded with calls—everyone imaginable—utilities, prospective manufacturers, distributors, and investors," Ferrari said.

The price for an E-bulb is said to be about $15. Ferrari said she expects the first widespread offerings to commercial and some residential customers, "similar to what utilities do with compact fluorescents."

The "induction" bulb uses a magnetic coil to generate a high-frequency radio signal that excites a gas causing a phosphor coating to glow, like a fluorescent bulb. Makers say the E-bulb provides the same light, but is four times as efficient as incandescent bulbs (about as efficient as compact fluorescent bulbs).

Like incandescents, the E-bulb has dimming capability, a smaller size, a wider variety of color, and lights instantly. The life of an E-bulb, said to be 20,000 hours, is not reduced by on-off switching. Incandescents last about 1,500 hours.

Intersource, working with Diablo Research Corp. of Sunnyvale, CA, says it has solved interference problems caused by previous radio-wave bulbs.

Cooling towers for revised clean water compliance would be costly

WASHINGTON—A report published in May estimates that if all 679 power plants with water discharge exemptions in the Clean Water Act were forced to install cooling towers, the retrofits would result in a loss of 9000 MW of capacity. The closed-cycle towers would be needed to reduce the plants' cooling-water discharge temperatures.

Environmental groups—mainly the Natural Resources Defense Council—oppose the exemptions that allow the plants to discharge warmed water into adjacent waterways. The Section 316(e) exemptions in the act allow for the discharges as long as they do not significantly affect the waterways' ecologies.

Produced by Stone & Webster Engineering Corp. for the Edison Electric Institute, the report says the changes would increase the plants' total water consumption by 1.5-million gpm.

In addition, emissions of CO_2, SO_2, and NOx would increase because of the additional fossil-fueled generating plants that would have to be built to make up for the lost 9000 MW. The loss would come because of the lower performance of generating plants with retrofitted closed-cycle cooling systems.

Construction, operation, and maintenance of the new plants would cost approximately $13 billion (in 1992 dollars). This was factored in as part of the estimated overall present-value cost of $41.3 billion the report says would be required for the cooling towers and new plants over 20 years.

The conclusions reached in the report were based on all the affected units retrofitting with closed-cycle cooling systems by year 2000. Hyperbolic or mechanical-draft wet cooling tower systems were identified as the most likely to be selected because they would maintain the most capacity in-service and were the least costly, available closed-cycle cooling systems.

Stone & Webster based its conclusions on case studies of the cost of retrofitting an existing 300-MW fossil-fired and an 1100-MW nuclear plant with closed-cycle cooling using cooling towers. This approach reflects the company's judgment that such retrofits represent a likely engineering solution that would be used by many of the plants if Section 16(e) were repealed.

Current total capacity of the affected plants is 189,000 MW, which is 32 percent of total U.S. steam-electric generating capacity.

The overall objective of the study was to gain a sense of the consequences of the repeal of Section 16(e), which is now before the U.S. Senate. The study did not consider detailed, site-specific factors that might influence potentially affected electric utilities' choices for compliance, nor did it consider other economic, social, and environmental impacts of the options chosen.

Summer economic transfers load transmission grid

PRINCETON, NJ—Transmission systems are being used more for cost-effective transfers of power when possible, according to the North American Electric Reliability Council.

The "NERC 1992 Summer Assessment" said, "Portions of the transmission systems will continue to be loaded near their limits to accommodate economy transfers of electricity."

The most recent Energy Information Administration statistics indicate a general increase in grid use. Net wheeling increased from 1986 to 1990 by 138.6 percent. In 1986, net wheeling in the U.S. was 2,547 million kWh; in 1987, 2,019; in 1988, 2,262; in 1989, 3,525; and in 1990, 6,077.

NERC has given strong warnings that mandates on grid use could adversely affect transmission system reliability (*EL&P*, 5/92, p.1).

Regional concerns

Regional concerns, said the NERC summer report, are worst in the Ontario portion of Northeast Power Coordinating Council (NPCC), and in the Florida portion of Southeastern Electric Reliability Council (SERC). The Ontario subregion margin dips to 8.0 percent in June and 8.8 percent in July. The Florida subregion will go as low as 10.6 percent in September. The average margin for all regions, June-September, is 21.7 percent.

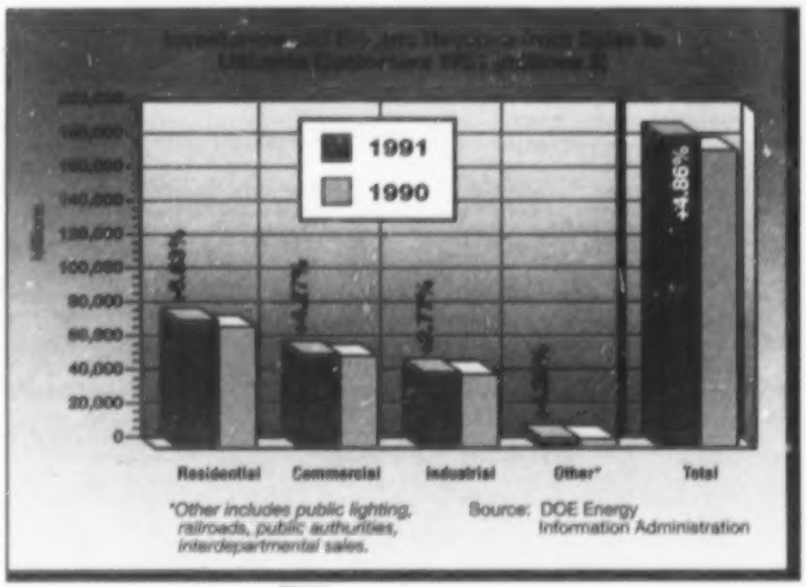
The report from Ontario says the reserve will be adequate, given a 6.5-percent fall in summer peak and continued economic slowdown. Concerns in Florida, however, are continuing ones.

"Capacity margins will be a little less than last year, particularly in the Florida and TVA subregions," the report said.

To alleviate possible tight margins caused by any "greater-than-normal forced outages," or "extremely high temperatures," utilities are exploring options that might improve margins.

These options include "testing of peaking units, maintaining or increasing transfer capabilities, deferring maintenance where possible, improving performance of cogenerators units, reviewing availability of assistance from other regions and reviewing emergency coordination plans and demand-side management programs," said the NERC summer report.

In June through September, regional margins vary from a low of 14.5 for SERC in August to a high of 37.7 for Mid-Continent Area Power Pool-Canada in July. Southwest Power Pool has a high of 30.6 in September.



*Other includes public lighting, railroads, public authurities, interdepartmental sales.

Source: DOE Energy Information Administration

'Appropriate' EV rates by '93: EEI

COLUMBUS, OH—The Edison Electric Institute called on members at the association's annual meeting here to have "appropriate rates" for electric transportation in place by June 1993.

"This resolution," said Michael Peevey, president of Southern California Edison and chairman of EEI's electric vehicle committee, "commits utilities to take concrete action to provide not only moral support for the concept of alternative vehicles, but to support organizations fighting for market penetration and to have in place throughout the industry appropriate charging rates by June of 1993."

Peevey said that appropriate EV rates should be lower than average rates, they should provide incentives for EVs, and they should be off-peak.

Herculean effort

He also said that a "herculean" effort is needed by utilities to have the necessary infrastructure in place to support EVs. He suggested that there should be battery-charge parking places at shopping malls, office buildings, etc.

Peevey said his company has started a partnership with LADWP, General Motors, and other parties to develop infrastructure needed in Southern California where EVs will be introduced in significant numbers in 1998.

Peevey said SCE plans to structure EV rates to encourage off-peak charging, 10 p.m.-6 a.m. He said he feels utilities could accommodate one-million electric vehicles with no need for new power plant construction by merely improving load factors.

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Energy bill...

open access.

She said the U.S. must avoid a situation where the Federal Energy Regulatory Commission has the power to order transmission construction without provisions for cost recovery from state regulators. The House bill mandates on transmission access, said Stuntz, are too rigid, giving FERC too much power to order access.

Holding company status

The new energy legislation would exempt independent power producers from Securities and Exchange Commission regulation and aims to promote additional competition among electricity generators.

Under present law, the SEC regulates financial matters of utilities operating in more than one state. Exemptions have been granted, within certain operating guidelines. Exempt companies must limit utility business to primarily a single state.

Ten registered holding companies account for about 25 percent of U.S. generation. About 54 percent of U.S. electricity was generated by 81 exempt electric and 29 exempt combination holding companies in 1991, according to a recent General Accounting Office report on utility holding companies.

PEPCo places obstacles in Olympians' way

Mark T. Hoske, News Editor

WASHINGTON—Potomac Electric Power Co. used its power to place obstacles in the U.S. Olympic Team's way and has been thanked for doing so.

By putting 17-ton concrete bolders in Dickerson Generation Station's discharge canal, PEPCo converted it into a training site for the U.S. Olympic Whitewater Slalom Team. The sluiceway's warm water and shelter provide world-class paddlers year-round training in comfort—as comfortable as one can be in raging water.

Course replicates Olympic run

Part of the run was made to replicate the course constructed for the 1992 Olympics in Barcelona, Spain. The summer games run from July 25 to Aug. 9. The time trials for Olympic Team qualification were held at Dickerson the weekend of May 16.

Olympic whitewater slalom hopefuls train this spring at Potomac Electric Power Co.'s Dickerson plant. PEPCo's efforts improved U.S. chances for a medal in Barcelona. Photo: Rick Giammaria, PEPCo.

"Several PEPCo customers are among the hopeful medal winners," said PEPCo spokesperson Steve Arabia.

For its work, PEPCo has received accolades from the sports world, the surrounding community, and customers throughout its Washington, DC-area service territory, according to Arabia.

"Our course is now well known among the athletes of the world," he added.

The concrete obstacles at the PEPCo training site are 2-17 tons and are unattached to the canal, held in place by their weight. Paddlers must go down the course through 25 gates, struggling against the current to get through some gates.

Dickerson's discharge is 900 feet long, 60-feet wide at top and about 30-feet wide at bottom, but the 75 obstacles reduce passage in places to 2-5 feet. Over the canal's length, 300,000 gallons per minute fall 16 feet. Arabia said the 1992 Olympic course is approximately 300 feet longer.

The project was conceived and completed in 90 days. The course, completed November 1991, was dedicated on Dec. 19. PEPCo donated $27,500 to the effort. The project cost about $75,000, but could have cost several hundred thousand dollars if built from scratch, Arabia said.

Volunteered time and effort

PEPCo employees and contractors adding two 138-MW combustion-turbines at Dickerson volunteered time, equipment and effort to the whitewater project. Dickerson, about 40 miles northwest of the White House, is on the Potomac River. It has three, 185-MW coal-fired units.

The course, not for public use, is administered through the Bethesda (MD) Center of Excellence, part of the U.S. Crew and Kayak Team.

COMMENTARY

Modest near-term T&D spending

Spending by electric utilities for power delivery products and services for the next few years is likely to be very moderate and will generally reflect the nominal 2-percent growth rate in energy sales projected by most industry analysts. The operative technologies for the near term will be upgrading existing power delivery facilities and an increased emphasis on energy conservation.

EL&P's survey of 100 electric utilities indicates that spending for transmission will increase about 4.9 percent over the next five years—slightly outpacing inflation. Transmission spending will be stable for the long run. It may edge up a little in the next two years but not to the high level of 1989.

The responders to our survey show that existing transmission lines in the voltage range 69 kV to 161 kV is by far the largest grouping—146,900 miles compared with 81,390 miles for the EHV group (230-765 kV). Planned additions for the next five years include 6200 miles of 69-161 kV and about 2000 in each of the EHV classes.

There are a few major transmission projects under construction or planned such as the Appalachian Power Co. 765-kV line from Oceana, WV, to Roanoke, VA, the 340-mile, 500-kV California-Oregon Transmission Project, and the 268-mile, 500-kV GPU-DQE line in Pennsylvania, but not too many other large projects.

Our survey indicates a 4.9-percent increase in the number of miles of line rated 230-kV through 765-kV lines in the next five years. A comparison of figures published by the North American Electric Reliability Council (NERC) shows an increase in this voltage class of 8.8 percent over the next 10 years. NERC figures show a base of 147,000 miles of EHV lines at the end of 1990.

Utilities are hoping there won't be a need to buy equipment and services as a result of major storms as happened in the 1991 storm that ravaged northern Indiana and destroyed 95 steel towers within a 25-mile stretch on one 765-kV line, 90 double circuit structures on a 345-kV line, and 165 structures on a 230-kV line.

Spending for distribution facilities is tied very closely with new housing starts although it lags that industry about six months. Housing starts may pick up in the fall by as much as 10 to 15 percent and then stabilize. Some new housing starts may indicate a shift in population rather than totally new loads.

Energy conservation is being stressed at most utilities with demand-side management programs at the customer level and energy efficiency programs for the supply side including low-loss transformers, reconductoring and upgrading low-voltage lines to reduce losses. This will open up the market for those services and products associated with these technologies.

EL&P's survey and input from industry analysts indicate that load growth will stay in the range of 1.5-2.0 percent for the short-term future. This projected modest increase in load growth and the financial constraints will also increase the pressure from proponents of transmission line access. The rights to any available spare capacity in transmission facilities will be hotly contested.

Wayne Beaty, Senior Editor—Power Delivery

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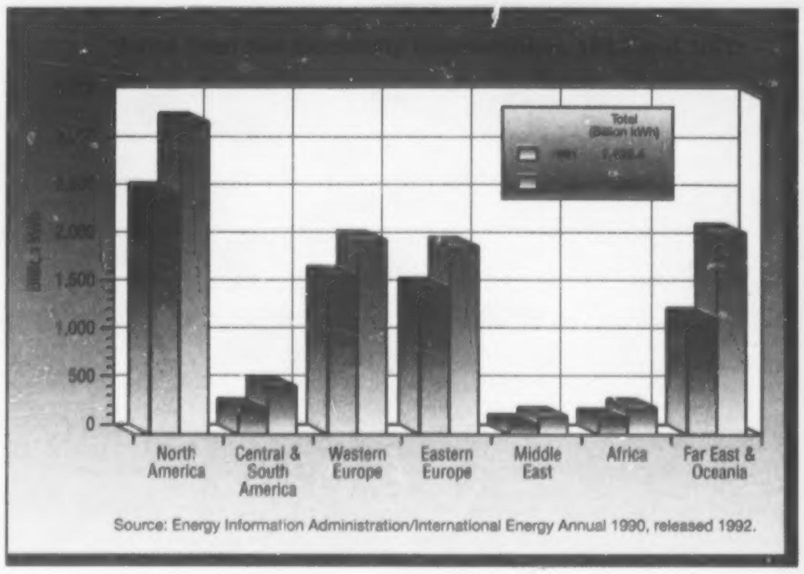
World total electricity consumption rose 2.8 trillion kWh from 1981-90



Source: Energy Information Administration/International Energy Annual 1990, released 1992.

World total net electricity consumption rose from 7.4 trillion kWh in 1981 to 10.2 trillion kWh in 1990, according to the Energy Information Administration's 1990 International Energy Annual. Electricity consumption in the Middle East doubled, while the Far East and Oceania increased by 74 percent. Central and South America experienced a 73-percent gain, and Africa's consumption rose 59 percent. North America increased about 29 percent, Eastern Europe and the U.S.S.R. 27 percent, and Western Europe 23 percent from 1981-90.

NEWS BRIEFS

JILL MINNER, Assistant Editor

Illinois Power wins EEI's Edison Award

Edison Electric Institute chairman James Farrington announced that Illinois Power Co. received EEI's 1991 Edison Award. It was based on the utility's programs to improve relationships with customers and to improve service through employee teamwork and empowerment programs. Larry Haab, chairman of Illinois Power said that the utility's "shift in corporate culture" in 1991 after losing $440 million in the previous two years and suspending dividends "is nothing short of dramatic." The utility launched a Target Teamwork Program in which employees were encouraged to form four- or five-person teams to improve customer service and efficiency. More than 80 percent of utility employees participated and submitted more than 5000 suggestions that yielded $18 million in savings in 1991 alone, said Haab. A new, centralized, 24-hour service center was opened in 1991 that handled 25 percent more customer requests than were handled with the former system. "It's a great honor—I can't say how great," said Haab. The award recognizes the EEI member that contributed the most to industry growth and development in 1991.

Westinghouse, Rolls-Royce sign agreement

Westinghouse and the English firm Rolls-Royce have agreed to transfer technology and cooperate in marketing gas turbines. Westinghouse, explained John Yasinsky, president of the firm's power systems operation, will package simple-cycle and combined-cycle power generation systems built around Rolls-Royce's aero-derivative gas turbine engines. Now Westinghouse has both the industrial and aero-derivative gas turbine product types, similar to General Electric's product line. Yasinsky said the first new product will be a 25-MW simple cycle machine built around the Rolls-Royce RB211 engine. A new, 50-MW, 42-percent efficient simple-cycle unit based on the Rolls-Royce Trent engine will be available for bids later this year for delivery in 1995, said the executive.

Utility execs say industry unprepared: survey

Only 45 percent of senior utility executives surveyed feel that their company is "well prepared or extremely well prepared" to respond to key strategic issues they expect to face in the next five years. In addition, 15 percent say their firm is "not very prepared," according to a survey conducted by Towers Perrin, a management consulting firm. Of the 240 senior utility executives polled, 43 percent were from electric utilities, 23 percent from gas utilities, 27 percent from combination utilities, and the rest from trade associations, power pools and other related entities. Competition and regulation were cited as two of the most important future issues. Only 28 percent of the respondents ranked environmental issues among the most important, and there was little emphasis placed on the importance of public relations. "Despite increased public involvement in utility issues—and increasingly poor ratings from the public—few respondents included [public relations] in their top issues," explained David Grender-Jones, vice president and director of Towers Perrin Utilities General Management Consulting Group. Future issues most frequently cited were: increased emphasis on customer service (48 percent) and more cost reduction efforts (46 percent).

Cooperation among disciplines prevents burner damage

COLUMBUS, OH—Engineers, the plant manager, and operations and maintenance superintendents teamed up to prevent burner damage in their coal plant by detecting early signs of burner pluggage.

Key is differential pressure

At Ohio Power Co.'s Muskingum River Plant in Beverly, OH, they developed a system that uses the difference in static pressure between two burners to detect coal pluggage. By automatically monitoring differential static pressure, the system indicates plugging before a hot-burner condition can develop.

The detection system includes an electronic differential pressure cell, a recorder with a scale that reads a range of −10 to +10 in. of water pressure, and an alarm with setpoints at +4 and −4 in. of water. The warning system can record a developing change in differential pressure within a minute.

In the plant, the developers found that a pressure differential between two burners could be zero inches of water for several hours and then change to 4 in. suddenly. Within 5 minutes of the increase, the higher-pressure-reading burner temperature began to rise.

Purging

Purging the plugged burner's line with air immediately after detecting the pressure rise can clean the burner and usually prevented the temperature buildup. Then coal run through the purged unit indicates a zero pressure differential when it has been cleaned.

Estimated cost at the plant of a complete burner pluggage system was $20,200. This included $15,000 for components and $5,200 for 260 work-hours for design and installation.

The components included one alarm monitor, eight transmitters, nine alarm boards, a power supply, a flowrater, and miscellaneous items such as valves, tubing and conduit. The package records eight burner line differentials with 16 alarm points.

Savings

Maintenance records tell the story. Since introduction of the system, maintenance per year caused by plugged burners has been reduced by 768 work-hours, for an annual saving of $15,360.

The method is now being installed at Ohio Power's Kyger Creek and Clifty Creek Stations.

New lead battery will charge faster

AUSTIN, TX—A new lead-acid battery can recharge halfway in eight minutes, compared to an eight-hour full charge for typical lead-acid batteries, said maker Electrosource Inc. on May 27.

A 99-percent recharge takes a half hour, the company said. Utility uses might include electric vehicles (EVs), peak shaving, cordless tools, and for remote switching. An Electrosource official said one of the first applications may be for Chrysler's EV program.

Commercialization is two to three years away, the company said.

One source of support for the effort is the Electric Power Research Institute.

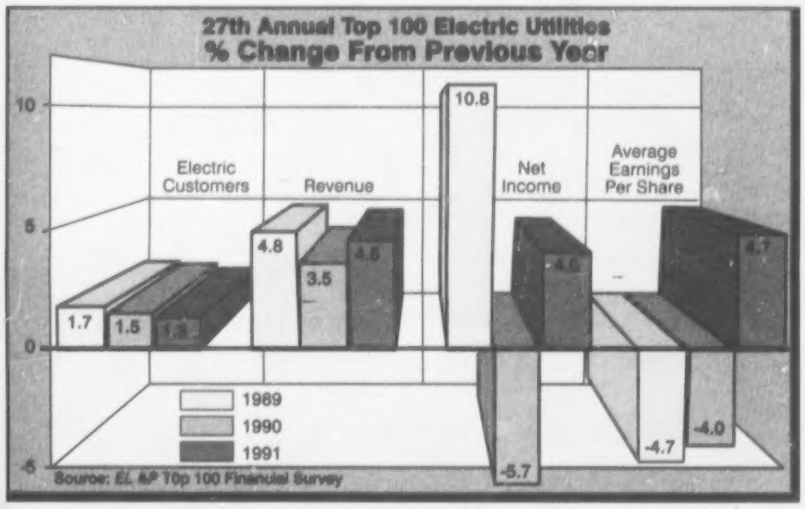
"This advanced lead-acid technology holds great potential for meeting electric vehicle battery requirements in the near term," said EPRI's Jack Guy in a statement.

Corrections

SAN FRANCISCO—In the story seeking papers for the DA/DSM Symposium (*EL&P*, 5/92, p.3), the telephone number was incorrectly listed.

The correct number is 415/647-9003 for DA/DSM '93, Third International Symposium on Distribution Automation and Demand-Side Management. The meeting is Jan. 11-13, 1993, in Palm Springs, CA, and is sponsored by The Eureka Group.

The graphic, *EL&P*, June '92, page 2, excluded petroleum from the mix of electricity generation. The percentage of 1991 U.S. electricity generation by fuel was 54.9 coal, 21.7 nuclear, 9.8 percent gas, 3.9 oil, and 0.4 geothermal, wood, wind, waste, and solar, according to the Energy Information Administration.



This graphic, *EL&P*, 6/92, p.1, reversed the colors for 1989 and 1991. The correct version is shown.

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ELECTRIC LIGHT & POWER
EL&P
AUGUST 1992
Volume 70, Number 8
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VOICE OF THE ELECTRIC UTILITY INDUSTRY

LATE NEWS

A June 29 earthquake, centered 14 miles from the proposed Yucca Mountain high-level nuclear waste storage site, registered 5.6 on the Richter scale. It caused nearly $1 million in damage to a nearby, Department of Energy cinder-block building. The quake raises questions of site suitability, and might lead to further delays and higher program costs.

The '92 Democratic Platform says the U.S. should join European allies in agreeing to limit CO_2 emissions to '90 levels by 2000.

EPA proposes SO_2 allowances

Mark T. Hoske, News Editor

WASHINGTON—Environmental Protection Agency proposed sulfur-dioxide emission allowances for more than 900 generating plants in mid-June.

The regulations gave electric utilities their first look at allowances for the Phase 2, year-2000 allocations in the emerging regulations for Clean Air Act Amendments of 1990. Phase 1 allocations start in 1995 and were written into the law.

Southern Company, with five operating utilities, has the most Phase 2 allowances under the proposal, 722,700 per year. American Electric Power is second with 558,700, and Tennessee Valley Authority, a federal utility, is third with 429,100 (see figure).

TOP 10 RECIPIENTS OF SO_2 ALLOWANCES UNDER PROPOSED EPA EMISSION REDUCTION RULE

	Phase 1	Phase 2	Total
Southern Company	756,800	722,700	**1,479,500**
American Electric Power	476,900	558,700	**1,035,600**
Tennessee Valley Authority	552,600	429,100	**981,700**
Alleghany Power Services	355,500	219,100	**574,600**
Public Service Co. Indiana	284,800	143,400	**428,200**
Union Electric Co.	227,900	136,300	**364,200**
Pennsylvania Power & Light Co.	172,800	153,400	**326,200**
General Public Utilities Corp.	85,900	227,900	**313,800**
Ohio Edison Co.	161,900	112,800	**274,700**
Texas Utilities Generating Co.	0	270,700	**270,700**

Source: EPA National Allowance Data Base, AER*X

These are the top 10 allowance recipients as proposed by the Environmental Protection Agency tallied by AER*X. Bonus allowances are excluded because bonuses have not been decided.

Because the law allotted more allowances than would fit under the emission cap, the EPA also reduced by 9 percent the total number of available allowances, said EPA's Brian McLean, director of the Acid Rain Division.

Emissions of SO_2 will be cut nearly in half by 2000 from 1980 levels and capped at just under 9-million tons.

"Today's proposal, when final, will give the nation's utilities a tough new set of acid-rain requirements, as well as providing more certainty for decision-making on emission trading and long-range compliance planning," said EPA Administrator William Reilly.

Allowances—a flexible emissions-control method that lowers cost of compliance—allows the owner to emit one ton of SO_2 during or after a given year. Even with allowances however, emitters must abide by EPA health-based standards. Sulfur-dioxide, just one substance controlled in CAAA, contributes to acid rain.

Final permit rule released

In related news, the EPA announced the final air permits rule June 25. Those provisions shift enforcement of the Clean Air Act Amendments to states' permitting programs. The rule requires all major sources of pollution—including those related to acid rain, air toxics and smog—to obtain a state operating permit. The definition of "major source" depends on the region. States must form and submit plans for permitting to the EPA for approval by November 1993. Estimated permit fees will bring more than $330 million to states.

The EPA completed the proposed allowance rule mid-June, but it didn't appear in the federal register until July 7. After a 60-day comment period, and a July 15 EPA public hearing, the agency hopes to finalize the assignment of SO_2 allowances by year end.

Decision helps compliance planning

The allowance proposal followed the acid-rain rule, proposed in December 1991. Phase 1 affects 110 plants. Phase 2 sets more stringent requirements for those plants and more than 800 other plants. Utility Phase 1 compliance plans are due Feb. 15, 1993.

See pp.9-13 for more clean-air coverage in EL&P's special report on The Elements: Air

Nine-million allowances are worth $2.7 billion a year at a price of $300, if they are all traded once a year at that price. For the Southern Company, the utility receiving the most allowances, the value of the allowance proposal exceeds $215 million a year in Phase 2, assuming one trade at $300 per allowance.

Allowance prices will vary depending on factors such as state regulatory deci-

Continued on page 7

Ohio Edison buys SO_2 allowances in first transaction with non-utility

AKRON, OH—Ohio Edison agreed to purchase 5000 sulfur-dioxide allowances annually from Alcoa Generating Corp. for $250-350 during five years starting in 1995.

The deal

Part of the deal was not to disclose an exact price, an Ohio Edison (OE) spokesperson said. If the agreed-upon price is $300 per allowance, the transaction would total $7.5 million.

It was the first SO_2 announced transaction between an electric utility and a non-utility company and only the third publicly announced altogether. The first transactions were Wisconsin Power and Light Co.'s allowance sales to Tennessee Valley Authority and to Duquesne Light Co. (*EL&P*, 6/92, p.1)

Alcoa will obtain the allowances by using low-sulfur coal to cut SO_2 emissions at its Warrick Power Plant.

Small investment, comparatively

OE's investment in the allowances is small compared to its other pollution-control efforts. The company reports spending more than $2 billion on environmental protection since 1975, or 15 cents per dollar that Ohio Edison retail customers pay in rates.

That amount includes $250 million for scrubbers and environmental systems for OE's half ownership interest in the 2700-MW, coal-fired Mansfield plant. OE has participated in 10 clean coal research projects, more than any other utility, the company said.

"Even so, we, too, must achieve further reductions," said Robert J. McWhorter, Ohio Edison senior vice president, "and we have been taking cost-effective steps to do so."

Coal contracts include allowances

Recent coal sales agreements enable Ohio Edison "to specify the sulfur content of coal we receive from several suppliers, who can either meet our specific requirements for lower-sulfur fuels or provide an equivalent amount of emission allowances," said McWhorter.

Ohio Edison expects to complete its compliance plan for the Clean Air Act Amendments of 1990 later this year.

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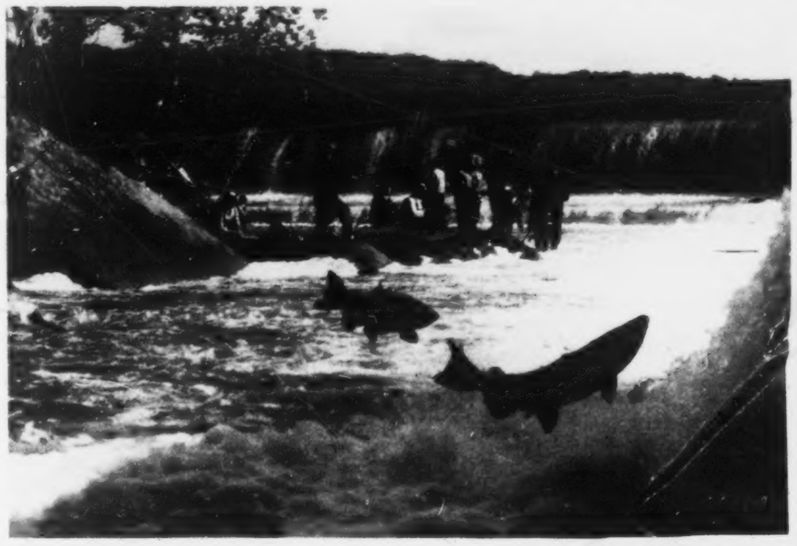


Fishing gets safer near hydro plant

Niagara Mohawk Power Corp. worked with communities near the 8.8-MW Varick hydro plant to enhance the area, including an alarm system to warn of rising water. The Oswego River site attracts thousands of fishing enthusiasts, especially during autumn salmon runs. See the full story this issue.

ComEd, LCRA, NYPA, AEP lead among wholesale suppliers

BOULDER, CO—The five utilities best positioned to sell wholesale electricity in the U.S. are Commonwealth Edison Co., Lower Colorado River Authority, New York Power Authority, American Electric Power Co., and The Southern Company, according to a new Research Data International study.

The wholesale electricity benefits the buyers as well as the sellers. During the past 10 years, bulk power purchase expenses lowered the average U.S. electric utility's generation costs by almost 10 percent, the study said.

"Wholesale power sales account for more than 20 percent of the $178 billion in total annual revenues of the electric utility industry," said RDI. In volume, wholesale purchases, interchange or wheeling amounted to 63 percent of all power generated in 1990, up from 55 percent in 1986.

Best "targets" for bulk power sales

Utilities best positioned for maximum benefit from purchasing power are Niagara Mohawk Power Co., Gulf States Utilities, San Diego Gas & Electric, Consumers Power, and Old Dominion Electric Cooperative, "because of their limited capacity and high production costs," explained Kent Knutson, RDI vice president.

The most competitive bulk power buyers and sellers are two key areas studied in "Bulk Power Markets in the U.S." The 500-page report includes more than 400 utilities, investor-owned, publicly owned, and cooperatively owned. Also discussed are industry developments influencing the bulk power market.

While Commonwealth Edison was ranked as the top competitor for market share, it was by no means the largest seller at 6,791 GWh in 1990, the most recent year for which data was available. TVA was the top seller at 95,254 GWh; AEP was second at 44,181 GWh.

Criteria for the bulk power rankings include: generation costs, capacity and load factors, present power sales, bulk power sales opportunities and competitors, transmission capabilities and costs, fuel contracts, and acid-rain compliance costs.

According to the RDI study, $32.2 million is the average sulfur-dioxide compliance cost for the 30 hardest hit utilities in Phase 1 of the Clean Air Act Amendments.

For Phase 2 SO_2 compliance cost, the same 30 utilities average $95.3 million.

The highest Phase 1 SO_2 compliance cost is AEP's Ohio Power at $95 million. Tennessee Valley Authority reported the highest Phase 2 compliance cost at $261 million, closely followed by Southern Co.'s Georgia Power at $250 million.

Competitive suppliers, regionally

According to RDI's criteria, the top competitors for market share of bulk sales are, by region:

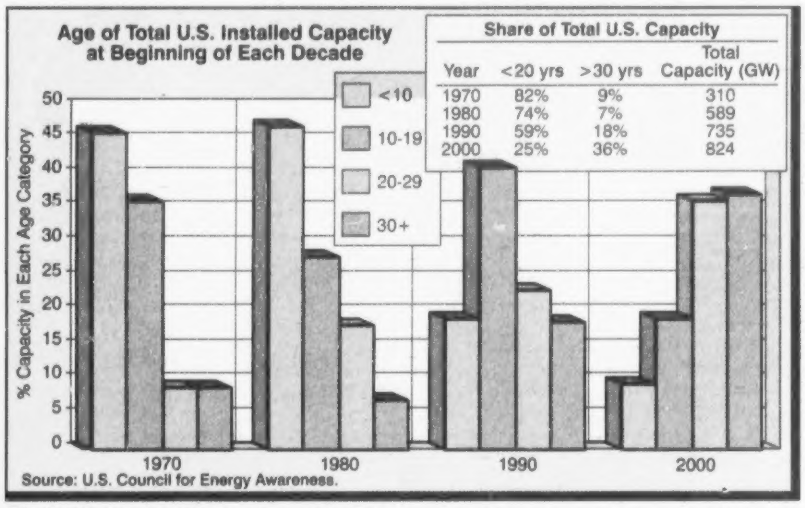
- Northeast Region, MAAC: Pennsylvania Power & Light, Public Service Electric & Gas, Philadelphia Electric.
- Northeast Region, NPCC: New York Power Authority, Public Service of New Hampshire, New York State Electric & Gas.
- Southeast Region, SERC: The Southern Co., Duke Power, Tennessee Valley Authority.
- East North Central, ECAR: American Electric Power, Allegheny Power System, PSI Energy.
- North Central, MAIN: Commonwealth Edison, Union Electric, Illinois Power.
- North Central, MAPP: Iowa-Illinois Gas & Electric, Iowa Public Service, Minnkota Power Co.
- South Central, ERCOT: Lower Colorado River Authority, City of Austin, TX, Texas Utilities.
- South Central Region, SPP: Southwestern Power Administration, Kansas Gas & Electric, Grand River Dam Authority.
- Western Region, WSCC: Bonneville Power Administration, Western Area Power Administration, Arizona Public Service.

The top recipients

The top recipients, or targets, for bulk power sellers, are, by region:

- Northeast Region, MAAC: Baltimore Gas & Electric, Jersey Central Power & Light, and Metropolitan Edison (both General Public Utilities).
- Northeast Region, NPCC: Niagara Mohawk Power, Northeast Utilities, Consolidated Edison.
- Southeast Region, SERC: Old Dominion Electric Co-op, Virginia Electric Power, Florida Power & Light.
- East North Central, ECAR: Consumers Power, American Municipal Power of Ohio, Ohio Valley Electric Corp.
- North Central, MAIN: Wisconsin Public Service, Wisconsin Electric Power, Soyland Power Co-op.
- North Central, MAPP: East River Electric Power Co-op, Minnesota Power & Light, Lincoln Electric System.
- South Central, ERCOT: Tex-La Electric Co-op, Houston Lighting & Power, South Texas Electric Co-op.
- South Central Region, SPP: Gulf States Utilities, Sam Rayburn G&T, Northeast Texas Electric Co-op.
- Western Region, WSCC: San Diego Gas & Electric, City of Anaheim, CA, Southern California Edison.

DSM and aging capacity will augment baseload need: USCEA



Share of Total U.S. Capacity

Year	<20 yrs	>30 yrs	Total Capacity (GW)
1970	82%	9%	310
1980	74%	7%	589
1990	59%	18%	735
2000	25%	36%	824

Source: U.S. Council for Energy Awareness.

WASHINGTON—While demand-side management is usually seen as a way to delay new generation, the U.S. Council for Energy Awareness says intense DSM interest signals a growing need for baseload generating units.

This finding was part of recent USCEA study on aging power plants by Mills, McCarthy & Associates.

USCEA, a promoter of nuclear power, said "widespread implementation of utility demand-side management programs...shifts demand away from expensive peak periods toward greater use of economical baseload generation."

USCEA continued that "Such shifts save consumers money and reduce the urgency for building new capacity. This tends to shift the net increase in demand from economic growth away from peaking toward baseload generation."

This trend, along with continuing electrification of U.S. energy needs and aging generating plants, will require the U.S. to "refurbish, re-license, rebuild or simply order new baseload generation," according to USCEA.

During the decade 1990 to 2000, the share of all U.S. generating capacity over 30 years old will double (see figure). By 2000, 36 percent, or nearly 300,000 MW of capacity will exceed 30 years.

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Generator retrofit features static exciter

MILWAUKEE—Siemens Power Corp. announced it has completed an unusual retrofit to the generator of San Diego Gas & Electric's 300-MW, 20-yr-old Encina Unit 4. A static excitation system replaced the generator's rotating, brushless exciter. The stationary exciter is expected to be more reliable and controllable, says Siemens. "The problem with these old, existing units is not exclusive to San Diego Gas & Electric," said Richard Carlson, president of Siemens' A-C Equipment Services Group, which did the work.

Entergy hopes to acquire GSU in 1 yr

NEW ORLEANS—Within a year, Entergy Corp. hopes to make Gulf States Utilities its fifth operating utility.

Entergy and GSU announced the $2.3-billion acquisition plan on June 8 (*EL&P*, 7/92, p.1). The $20-per-GSU-share offer was 38 percent higher than GSU's June 5 closing price. The companies anticipate that 10-year fuel-cost savings of $646 million can lower GSU rates.

Entergy's Cyril Guerrera said preliminary regulatory filings were made in Texas and Louisiana state on July 1.

Guerrera said Entergy hopes that it will be able to complete the merger in 12 to 18 months."But we sure would like to keep it on the shorter time frame."

A transmission tariff advantage?

Entergy has an advantage over other recent extended merger proceedings, Guerrera suggested, because of its open market-based transmission tariff filed with the Federal Energy Regulatory Commission. FERC has conditioned approval for several other mergers on transmission access issues.

If the merger is successful, Entergy will gain direct access to Texas, and greater opportunities for wheeling and bulk power sales.

GSU has had financial challenges related to its largest asset, the River Bend nuclear plant. Entergy, which operates four nuclear units, has one of similar design.

About the utilities

Entergy, formerly Middle South Utilities, serves more than 1.7-million customers through Arkansas Power & Light, Louisiana Power & Light, Mississippi Power & Light, and New Orleans Public Service Co. Entergy, with 12,500 employees, had 1991 sales of more than $4 billion.

GSU serves 579,000 customers in South Louisiana and Southeast Texas, has 4,800 employees, and had 1991 sales of $1.7 billion.

GSU would operate as a subsidiary and remain based in Beaumont, TX, the companies said.

Utilities seek transmission forum

WASHINGTON—The "Inter-regional Transmission Coordination Forum" seeks federal approval to resolve transmission and bulk power technical issues in the Northeast.

The ITCF now consists of 20 investor-owned utilities, Tennessee Valley Authority, New England Power Pool, and two independent power producers.

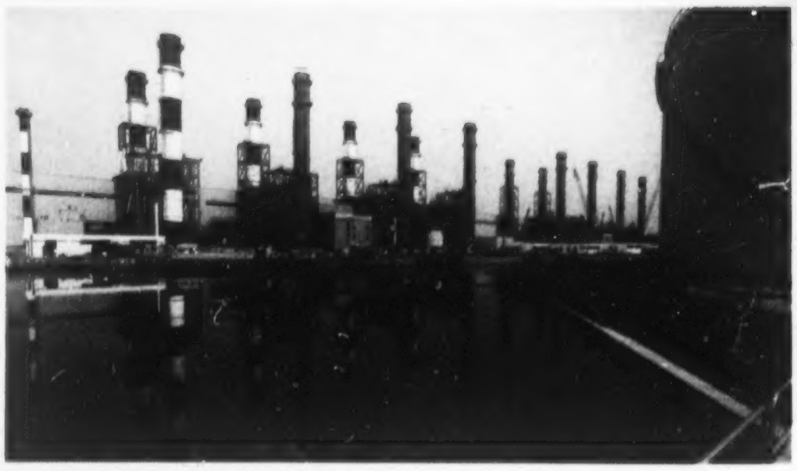
The group asked the Federal Energy Regulatory Commission to approve its charter, bylaws, and dispute-resolution guidelines, since ITCF activities will affect FERC-governed rates and services.

ITCF membership is voluntary and open to all regional providers. It follows reliability criteria and guidelines set by the North American Reliability Council and NERC's regional councils. ITCF will not take positions on legislation, said a spokesman for General Public Utilities, an ITCF member.

Mission statement: cooperation

According to Robert Arnold, ITCF chairperson, "The mission of the ITCF is to promote cooperation and coordination between the owners, operators, and users of regional interconnected transmission systems to assure system integrity and maximum reasonable use of facilities for economic benefit."

Further, ITCF intends to "encourage investment in additional facilities to maintain reliability or enhance transfer capability or both," said Arnold, who is executive vice president for power supply for GPU Service Corp.



Korea Electric Power's Seoinchon plant has combined-cycle gas turbines used at Chesterfield 7 and 8.

Combined-cycle plant commercial by yr-end

By December, Korea Electric Power Co.'s Seoinchon plant is expected to operate at 2000 MW. Eight combined-cycle, gas turbine generators, fueled by liquified natural gas, are expected to be the world's most thermally efficient large power plant, according to General Electric.

The plant uses GE Stag 107F combined-cycle units like those used at Virginia Electric Power's Chesterfield 7 and 8. Chesterfield 7 is the most thermally efficient large U.S. power plant at 51 percent, GE said. Chesterfield 8, rated at 218 MW, began commercial operation in June. These units, in Korea and the U.S., are the first heavy-duty gas turbines to fire at 2300°F in daily commercial use, GE said at the 1992 ASME Turbo Expo, in Cologne, Germany.

$30M offered for ultra-efficient refrigerator

SACRAMENTO, CA—A group of utilities intend to encourage manufacture of super-efficient refrigerators by offering more than $30 million to the winner of a competitive bid.

"Refrigerators and freezers consume approximately 20 percent of the electricity used in American homes, and much of that is wasted," said Richard Harkness, executive director of the non-profit group, Super Efficient Refrigerator Program (SERP).

SERP expects the winning refrigerator to use 25-50 percent less electricity than those now sold and not contain ozone-harming chlorofluorocarbons. The unit should be designed, tested and selected in 1993 and on the market as early as 1994 at a comparable price to other refrigerators, SERP said.

The reward operates as a demand-side management program because the winning-manufacturer gets the prize when refrigerators are delivered to participating utilities' service territories. Utilities contribute the award based on number of residential customers.

About 25 utilities are current or prospective members; more are welcomed, Harkness said.

U.S., Canada electric rates stay low among industrial nations

PARK RIDGE, NJ—Despite increases in U.S. commercial/industrial electricity rates during the last two years, U.S. rates remain "among the least expensive compared to rates in industrialized countries worldwide," according to a survey by National Utility Service.

Lowest rates

Canada's electricity rates were the lowest of all nations surveyed (see table), with an average increase of 0.9 percent, 1991-92.

The survey looked at rates for 1000 kW customers at 450,000 kWh per month, said NUS, an energy and telecommunications rate consulting firm. These customers would be large commercial, or industrial. Rates within utilities usually vary widely depending on customer size and other factors.

Reasons for increases

The 24 U.S. utilities surveyed increased rates by an average of 0.5 percent, 1991-92. Rates of 13 increased, 10 fell, and one remained unchanged, NUS noted. In a 1990-91 survey, NUS reported a 3.3-percent gain.

Most price movements from 1991 to '92 were from fuel costs, although "over the next three years, electricity rates, on average, will increase due to compliance with the Clean Air Act," commented Ed Tirello, a managing director at Smith Barney.

Largest increase

Among U.S. utilities in the survey, Houston Lighting and Power had the largest increase, about 12 percent, related to costs of a new generating plant.

The United Kingdom's 9-percent increase primarily was from higher wholesale rates, NUS said. UK rates may continue to increase, related to industry restructuring, NUS suggested, "if the government doesn't impose pricing controls on utilities."

Electricity Costs by Country, 1991-92 With Some U.S., Canada Utilities
(Customer Size 1000 kW; 450,000 kWh per Month)‡

Country or Utility	Cents per kilowatthour April '92	Cents per kilowatthour April '91
Manitoba Hydro	3.14	3.05
Saskatchewan Power	3.46	4.93
British Columbia Hydro	3.50	3.38
Transalta Utilities Corp.	3.84	3.29
Public Service Co. of Oklahoma	4.05	4.15
Hydro Quebec	4.22	4.00
New Brunswick Electric	4.38	4.38
American Electric Power (Ohio subsidiaries)	4.67	4.67
CANADA*	**4.66**	**4.64**
Newfoundland Light & Power	4.72	4.72
Texas Utilities	4.86	5.23
Dominion Resources	4.97	4.90
AUSTRALIA*	**5.03**	**4.85**
Duke Power	5.34	4.99
Nova Scotia Power	5.38	5.15
Louisiana P & L (Entergy)	5.50	5.53
Florida Power & Light	5.64	6.05
Consumers Power	5.65	5.87
SWEDEN*	**5.68**	**5.56**
NORWAY	**5.71**	**5.95**
Ontario Hydro	5.78	5.15
FINLAND	**5.84**	**5.55**
Union Electric	5.91	5.91
Georgia Power (Southern Co.)	6.00	6.01
NETHERLANDS*	**6.09**	**6.23**
Houston Lighting & Power	6.24	5.55
Carolina Power & Light	6.29	6.33
Pennsylvania Power & Light	6.67	6.31
FRANCE	**6.74**	**6.65**
USA*	**7.02**	**7.00**
Niagara Mohawk Power	7.31	7.81
Commonwealth Edison	7.33	7.89
UNITED KINGDOM	**7.38**	**6.79**
IRELAND	**7.46**	**7.46**
BELGIUM	**7.81**	**7.79**
Detriot Edision	7.83	7.56
Ohio Edison	7.86	7.80
Public Service Gas & Electric	8.08	8.03
Maritime Electric Co.	8.38	8.38
Pacific Gas & Electric	8.48	8.27
Jersey Central Power & Light	8.65	8.56
Philadelphia Electric	9.26	8.82
Consolidated Edison	9.98	10.69
Southern California Edison	10.09	9.79
GERMANY*	**10.22**	**10.27**
ITALY	**10.43**	**9.86**
Long Island Lighting Co.	11.90	11.17

‡ Typically an industrial or large commercial customer. Rates often vary widely within a utility.
* These countries' rates are based on a number of major utilities and are not necessarily the national average.
Taxes were excluded for utilities in states and nations that exempt purchases of this size. Monetary exchange was based on the *London Financial Times*, April 1, 1992, listing, 1£ = $1.724

Source: National Utility Service, Park Ridge, NJ.

COMMENTARY

Media rips SO_2 emission trade

Much of the media passed judgment in coverage of the first SO_2 emissions trade (*EL&P*, 6/92, p.1). This may have resulted largely from a May 12 story in *The New York Times*. Its front-page headline said: "UTILITY IS SELLING RIGHT TO POLLUTE." The headline where the story jumped was similar.

Under provisions of the Clean Air Act Amendments of 1990, Wisconsin Power & Light sold 10,000 sulfur-dioxide allowances to Tennessee Valley Authority and from 10,000 to 25,000 more to Duquesne Light Co.

The New York Times story's lead explained the first deed: "Two utilities hundreds of miles apart will announce today that they have signed a contract that calls for one to buy from the other the right to emit a chemical that causes acid rain, freeing the dirtier one from having to clean up its own plants as stringently."

Other media picked up this negative tone. To its credit, *The New York Times* story eventually pointed out some benefits of emissions trading, but not before slinging more mud at the electric utility industry and the Environmental Protection Agency.

As a result of this and similar general media coverage, the view the public received was of several evil utilities selling or buying the right to pollute. This abusive language comes from editors looking to catch the public's eye, rather than responsible journalists explaining what may be the farthest-reaching, lowest-cost, most-flexible and effective way ever to reduce air pollution.

Buried in the last few paragraphs, the May 12 *The New York Times* story finally contradicts its own headlines by saying: "Mr. Malec [of TVA] and others involved in the deal said it should not be construed as the sale of the right to pollute." Judging by other media coverage on the event, this small truth was too little, too late.

An efficient trading market will allow the industry to make the most cost-effective sulfur-dioxide reductions where they make the most sense. It helps the environment: utilities will use it to comply with the most comprehensive, and expensive air-quality law ever, at lower costs to ratepayers, without more expensive command-and-control measures. No matter what the compliance method, all utilities still must comply! Sulfur-dioxide emissions nationwide will be cut in half while allowance trading and market forces minimize costs.

Trading provides flexibility along with clean air. When air-monitoring equipment fails, or a plant suffers an unexpected outage, a plant owner can use purchased credits to comply with the law and preserve air quality, rather than just over-emit and pay a fine.

Instead of "UTILITY IS SELLING RIGHT TO POLLUTE," a more accurate—and just as catchy—headline would have been: "UTILITY MAKES, SELLS C~~LEAN AIR."~~ Please explain the distinction to people you know. It's not electric utilities against environmentalists. Look at what the industry is doing...we *are* the environmentalists.

Mark T. Hoske, News Editor

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LETTERS

Better communication is key

I enjoyed reading your commentary, "Gas and electricity: an uneasy alliance," in the May 1992 issue of *Electric Light & Power*. I strongly agree on the need to identify and address the many hurdles which are preventing the electric utility and natural gas industries from fully capitalizing on the benefits of their new "alliance".

The major barrier between our two industries is a very simple one—lack of communication. To rectify this, Tenneco Gas has been working closely with the electric utility industry since the mid-1980s, learning how to meet its needs and, in turn, providing information on the natural gas business. We have first-hand experience with the issues you described, particularly the role natural gas can play in electric utility compliance with the Clean Air Act Amendments of 1990.

Tenneco Gas, too, has found that a major obstacle to a stronger inter-industry alliance is electric utilities' belief that "natural gas (does not) offer sufficient security in future availability and price predictability to be a reliable base-load power plant fuel." Better communication and understanding is the key to overcoming this misconception.

Tenneco Gas has made a stong commitment to serve customers along its 20,000-mile pipeline system. In the last three years alone, the company has spent almost $400 million expanding capacity in the Northeast. Seventy-two percent of this capacity growth is to provide firm transportation of natural gas to electric generation facilities with 1,800 megawatts of new capacity for the region. Additionally, Tenneco Gas is a 50-percent participant in the $1-billion, 700MMcfd Kern River project to California where cogeneration/electric generation load is approximately two thirds of the throughput. We will continue to provide the infrastructure to meet electric utilities'—and other customers'—needs.

To address this issue from a supply perspective, Tenneco Gas developed an approach we call the "Producer/Pipeline Clean Air Team." Collaborating with natural gas producers, we can prove to electric utilities that long-term, price-"certain" natural gas contracts are widely available. In fact, we have an ongoing relationship with more than 20 major producers who meet the needs of the electric utility industry.

Tenneco Gas has been working to promote a dialogue between the industries and to explain the advantages of natural gas as part of a clean air compliance portfolio. We now are beginning to see the results of our efforts.

Late last month, American Electric Power announced that it was fuel switching four of its coal-fired electric generating units to natural gas with coal backup as part of its Phase I Acid Rain compliance plan. And to further demonstrate the benefits of cofiring natural gas and coal, Tenneco Gas is funding the retrofit of a coal-fired electric generating plant in Indiana where the use of natural gas will increase the plant's ability to burn local coal while also providing operational benefits.

Such results underline our belief that natural gas can provide an attractive option for electric utilities, not only for new generation capacity, but for meeting a key challenge of the future—stricter air quality standards at existing facilities.

Again, I enjoyed your commentary and would welcome the opportunity to further discuss Tenneco Gas' interaction with the electric utility industry.

H.C. "Chappy" Lucas
Manager, Clean Air/Select Use
Market Development
Tenneco Gas

NEWS BRIEFS

JILL MINNER, Assistant Editor

Battelle executive touts future technologies

In order to face increasing competition in the future electric utility market, each utility needs to formulate a technology strategy and make it an integral part of the company's corporate plan, according to Battelle President and CEO Douglas E. Olesen. Speaking at the Edison Electric Institute Convention/Expo '92 in Columbus, OH, Olesen listed ten "high-impact" future technologies: high-temperature superconductivity, neural networks, fuel cells, cold fusion, magneto-hydrodynamics, photovoltaics, the gas-engine heat pump, technology to mitigate electro-magnetic fields, electric vehicles, and LPPP (laser-powered potato peeler). Olesen noted that, "Electric vehicles represent—far and away—the one near-term, end-use technology breakthrough that would most fundamentally shift the growth curve of the electric industry."

BICC to buy Reynolds' cable operations

BICC Cables Corp. has signed a letter of intent to purchase Reynolds Metals Co.'s North American electrical cable operations as of September 1, 1992. Included in the sale will be Reynolds' four electrical division cable plants located in Arkansas, Texas, Washington and Quebec, and its cable technology center in Marshall, TX. As part of the agreement, Reynolds will enter into a long-term supply contract with BICC to provide aluminum redraw rod to the cable plants. BICC said it intends to integrate Reynolds' U.S. business with its Cablec Utility Cable Co., and the Quebec operation with the Utilities Division of Phillips Cables Limited.

Ebasco contracts to continue SMES effort

Ebasco Services Inc. signed a $4.7-million contract with the Defense Nuclear Agency of the U.S. Department of Defense to continue its work on the development of a Superconducting Magnetic Energy Storage (SMES) system. Under the agreement, Ebasco will continue to provide cost and technical data to the Defense Nuclear Agency. The data allows potential developers and users of the SMES system to select cost-effective, low-risk technologies for specific applications, according to Ebasco.

from page 1

SO_2 allowances...

sions related to trades and compliance, total energy demand, technology development, and fluidity of the market, said John Metzler, of AER*X, an emissions trading firm based in Washington, DC. Other factors include environmental regulations influencing coal prices, and how the air toxics section is written, Metzler said.

Allocations to existing units were based on an emissions rate multiplied by the unit's average fuel consumption from a 1985-1987 baseline period.

Fines for not holding enough allowances result in penalties, including $2000 per ton, far higher than the likely market price of allowances. Excess allowances, gained by installing pollution controls or other ways, can be sold.

Several allowance trades have occurred, placing allowance value at $250-350. (See related story and *EL&P*, 6/92, p.1)

Bonus allowances, available for certain plants from 2000 to 2009, will help accommodate expected economic and population growth, EPA said. Congress limited these to 530,000 a year. The Midwest and South get 50,000 extra per year starting in 2000.

The EPA proposal establishes four kinds of reserves. The Phase 1 extension reserve has up to 3.5-million allowances annually for 90-percent SO_2 removal or greater. The Conservation and Renewable Energy Reserve contains 300,000 total allowances for related EPA-approved measures. Clean coal technlogy gets a bonus if applied on higher emitting coal-fired plants.

The auction and sale programs get up to 2.8 percent of all allowances, providing an opportunity for new generators to obtain allowances, EPA noted.

For some utilities, exceptions to the proposed regulation didn't extend far enough. The EPA proposed that six utilities receive additional basic allowances as they requested, but 20 utilities seeking added exceptions for their plants didn't make EPA's proposed cut.

Among the rejections was Portland General Electric Corp.'s Boardman plant. PGE's request for 8,265 additional basic allowances was the largest single-plant rejection. Duke Power was denied 14,348 allowances for five plants.

Boardman, under economy shutdown during most of the baseline period, was given few allowances. Without obtaining a legislative exception, or additional allowances, PGE will only be able to operate the plant at 65-percent capacity from 2000-2009 and just 7 percent capacity after the year 2000, explained PGE's Roxanne Bailey.

Boardman burns low-sulfur coal with less than 0.5-percent sulfur. PGE operates and owns 65 percent of the 530-MW unit.

When asked about Boardman and similarly affected plants, McLean explained, "There was no perfect way to deal with the situation."

McLean said, "That's why there were bonus allowances put in, along with special provisions, for Boardman, and other plants in similar situations."

He said that some very clean plants came online in the early 1980s but operated for just short periods during the baseline. A three-year period intended to provide a more moderating period than a single year, McLean noted.

"I think EPA understands these utilities' situations," McLean said. "We had to make some tough decisions."

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DSM opportunities...

competitive bidding. Wisconsin Public Service Corp. started a program similar to WEPCO's, with room air conditioners worth the same $50 bond as refrigerators and freezers. American Electric Power is piloting the plan in central Ohio (in parts of Columbus Southern and Ohio Power territories).

In 1991, Niagara Mohawk started a four-year, 34,000-unit contract with Planergy, an Austin, TX-based company. This plan deals only with second refrigerators. It's unique in that the contractor handles the marketing (stuffers, TV, radio, newspapers) and disburses incentives at $50 per unit. Incentives and marketing are rolled into the fee.

Niagara Mohawk is proceeding on a region-by-region basis, limiting pickups to relatively short hauls into Syracuse. More distant points may be served by satellite plants or by mass hauling from scattered collection points.

In Bison, SD, tiny Grand Electric has met part of the recycling dilemma by getting its own $4,000 CFC reclaiming-recycling unit. Grand is also a Carrier and General Electric appliance servicing dealer, so reclaims the refrigerant from all trade-ins before scrapping them.

There's no question that appliance recycling, particularly second refrigerators, offers substantial benefits to customers, utilities, and society. Why haven't more utilities signed on?

Not all utilities are regulated; not all regulators have mandated DSM; not all regulators allow pass-through of DSM costs, not all utilities have or foresee near-to mid-term generating capacity problems that might encourage such programs. And even if all conditions suggest DSM, it takes time to evaluate some 200-odd options, to choose, budget, and implement the programs.

But are utilities interested? Both ARCA and Planergy say there's plenty of interest, and both look forward to expanding.

Program costs vary according to services desired, volume of appliances, length of contract, and transportation required, said John Cameron, ARCA president.

For one utility, the maximum economic haul is 150 to 200 miles. Enough volume to justify a recycling facility, often in or near an urban center, can help keep costs low. But cost-effective programs operate in rural areas, as well.

"Utilities who have used us find [appliance recycling] to be cost effective as far as DSM programs are concerned," Cameron said.

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Inquire R.S. 1

Climate, CO_2 get global attention

Science remains uncertain that carbon dioxide and other emissions cause global warming, or to what degree cuts would change any global climate trends now in progress.

Yet global warming exploded on the world's agenda this year with the United Nation-sponsored "Earth Summit." Because politicians often don't wait for scientific concensus to make policy decisions, many electric utilities aren't waiting either.

Fossil-fired electric generating plants, often singled out for contributing to the greenhouse effect, emit carbon-dioxide (CO_2) as part of combustion.

While removing CO_2 from fossil plant emissions is technically possible, it's still seen as too prohibitively expensive to be practical, said John Palmisano, of AER*X, a compliance planning company.

Even so, Larry Brodsky, a vice president with Illinois Power Co., predicted that within 10 years, the U.S. will embrace CO_2 controls. Present U.S. policy encourages voluntary control.

Until CO_2 scrubbing technology progresses, Palmisano said, utilities will use efficiency and load control, carbon sequestration, and nuclear power to offset CO_2 emissions. Brodsky and Palmisano commented at the most recent American Power Conference.

The Electric Power Research Institute (EPRI) expects electric utilities to lower U.S. CO_2 emissions by 685-million tons by 2010. Electric utility fossil units emitted 1,973-million tons CO_2 in 1990.

Utility contributions

Ways utilities manage CO_2 are to:

- Continue to promote energy efficiency, or demand-side management, which can displace combustion generating resources and prevent carbon from getting into the atmosphere. The Environmental Protection Agency's Green Lights efficiency program, now saves 8.7 MW, or 95-million pounds of CO_2 per year.
- Comply with existing environmental laws. Some strategies to cut other air emissions also cut CO_2.
- Continue growth of non-fossil generation.
- Plant trees or participate in other carbon-storage or cycling efforts. New England Electric System has experimented with an algae farm, while American Electric Power and other utilities look toward tree planting as a way to store carbon. American Public Power Association's Tree Power program aims to plant 16 million trees. An average tree absorbs 26 lb of CO_2 each year, APPA says.
- Commit to cut CO_2 by specified amounts. At least three major utilities have promised to do so. A 5-percent, gain in fuel-to-electricity conversion efficiency cuts CO_2 emissions by 10-15 percent, says DOE's Energy Information Administration.
- Promote efficient, electric applications.
- Continue related research.

All sides agree more research is needed on global climate. The EPA says 1988 was the third warmest U.S. summer since 1895, and 1990 was the 15th, but these may be within normal weather variation. Climatologists' estimates on global warming vary widely, from 1°C to 8°C by the year 2100. Interactions from a myriad of climatic inputs make simple cause-and-effect conclusions uncertain.

"The relationship of CO_2 and global warming is simply not known. We ought to know what we're doing before we do it," said James Watkins, secretary of the Department of Energy at the recent APPA Annual Conference.

Uncertainties include the effects of cloud cover, ocean currents, emissions of CO_2 and SO_2, volcanic activities, the speed of re- and deforestation effects, and limits to how much data can go into computer models. Despite uncertainties, and voluntary emission cuts, some say the risks of adverse global changes from warming warrant immediate mandates. Additional fears result because others say capping world emissions now might take many decades to reverse momentum of global climatic trends.

Also, general media, by their nature, can raise anxieties by accentuating extremes in headlines and sound bites, often without time or space to place things in context.

Earth Summit

Global warming concerns helped feed intense international pressure before and during the Earth Summit in Rio de Janeiro. Many world leaders at the 12-day meeting sought U.S. commitments to cap and make firm deadlines for CO_2 reductions. Negotiators for President Bush managed to revise an international treaty allowing flexibility without mandates.

The resulting UN treaty on global climate change starts when 50 nations sign. It includes voluntary reductions, research, progress reports, and provisions to modify guidelines based on research results.

DOE's Watkins said criticism directed at the U.S. has been undeserved. "We are the world leader in environmental protection," he said, adding that proposed 1993 spending on global climate is $1.4 billion, "more than all other nations combined."

Scientific and economic progress can help impoverished people develop sustained growth and protect the environment, Watkins said.

Even so, many people believe global warming is a very serious problem (see chart), according to a 22-nation, three-year survey by the George H. Gallup Institute presented at the Earth Summit.

U.S. utility customers feel that protecting the environment should be their utility's most important role, followed by keeping rates low, and conserving energy, according to a separate, May '92, Gallup survey.

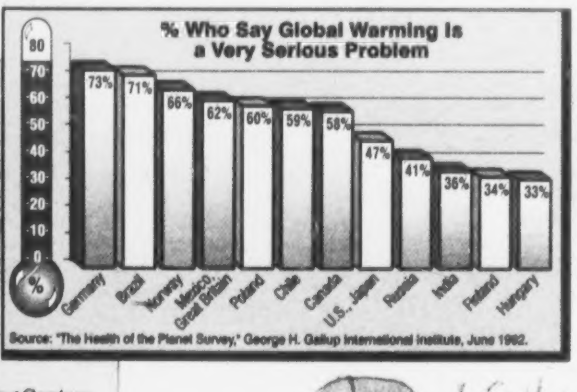
More electricity

Using more electricity and using it more efficiently means total U.S. energy use can decrease by the year 2000 while environmental benefits increase, said Richard Balzhiser, EPRI president.

"This is a powerful but counter-intuitive message that must be understood by environmental and consumer interests," said Balzhizer at APPA's meeting.

Of EPRI's estimated 685-million-ton cut in CO_2 emissions by 2010, more than half will come from using more electricity to displace more CO_2-intensive energy. Advantages of electric technologies, according to EPRI and Edison Electric Institute, include:

- Electric vehicles, which are 60 percent more energy efficient than gasoline counterparts.
- Fax machines, seven times as energy efficient as express courier.
- Steel making, 50 percent more efficient.
- Microwave, 90 percent more efficient for cooking.



Source: "The Health of the Planet Survey," George H. Gallup International Institute, June 1992.

Utility programs save energy, the environment

In Ohio, American Electric Power's Columbus Southern Power Co. and Ohio Power Co. began in mid-1991 to save energy and the ozone layer with Project Good Turn. In 1992, AEP expanded the program for all its Ohio customers.

By a toll-free call to Appliance Recycling Centers of America Inc. (ARCA), utility customers can get an old, energy guzzling refrigerator removed at no charge. AEP calculates that each old refrigerator adds as much as $9 per month onto a home's electricity consumption.

ARCA captures refrigerant gases—mainly chlorofluorocarbons (CFCs), which can damage the ozone layer if emitted. CFCs and energy inefficiency also may contribute to the suspected greenhouse effect.

PCB-contaminated capacitors are removed and incinerated, under government rules. Mercury switches are sent to a mercury reclamation company. Metals are reprocessed. Only insulation and plastic remain to be sent to a landfill.

Said Dale E. Heydlauff, vice president of environmental affairs for AEP Service Corp., "We're demonstrating the company's commitment to the environment." As of mid-June, Columbus Southern had arranged for more than 10,000 refrigerators to be recycled.

Other utilities have similar programs. Wisconsin Electric Power Co. disposed of 250,000 inefficient appliances in five years.

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Eastern states pass ozone pact

Twelve eastern states and the District of Columbia signed the Northeast Ground Level Ozone Control Agreement, committing to implement "interstate strategies and mechanisms which will control ground-level ozone."

The agreement, signed Aug. 4 by governors and the D.C. mayor, formalizes the region's commitment and recognizes the critical role of the Ozone Transport Commission (OTC).

Regional, cooperative air-quality efforts may give some states, and their utilities, an advantage in complying with federal environmental standards.

The Clean Air Act Amendments of 1990 formed the OTC, an interstate governmental body to control ozone. OTC has been working with state environmental agencies on strategies to comply with air quality standards.

Participants adopted NOx boiler requirements in March (*EL&P*, 5/92, p. 1).

The agreement involves Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and the District of Columbia.

Multi-state utilities may benefit when regulations are consistent across state lines, but states still may set more stringent guidelines within the pact. Still, the pact may help utilities, says Chuck Carlin of Northeast Utilities. He suggested that more cohesive rules for other ozone ingredients—nitrous oxides and hydrocarbons—could lessen requirements for stationary sources.

The first filings for states with urban ozone non-compliance areas are due to the Environmental Protection Agency by Nov. 15. Other deadlines vary, depending on the severity of the area's ozone (see table and related story).

Ozone and other standards

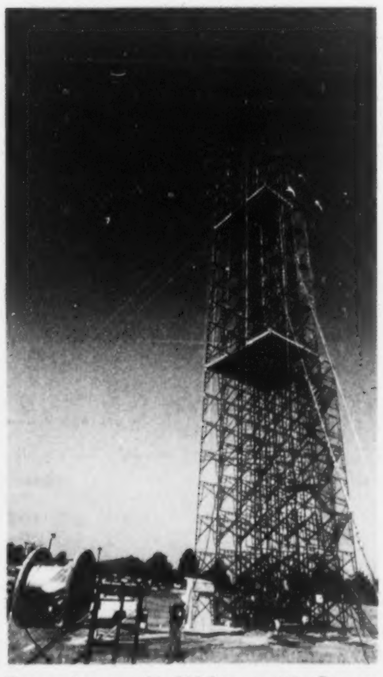
In related news, the EPA recently rejected requests for a tightening of its health-based ozone standard, explaining that provisions in Clean Air Act regulations would decrease ozone.

Other air-quality standards, for particulates, carbon dioxide, nitrogen dioxide, sulfur dioxide, and lead, may also affect utilities in areas where EPA health-based standards are not being met. Carbon-dioxide compliance deadlines are 1995 for moderate regions and 2000 for serious areas.

Southern study helps ozone compliance

ATLANTA—Ozone-related research is underway as compliance deadlines loom.

How states reduce ozone in non-compliance areas may affect operation of utility fleets and generating facilities. (See related story on northeast states.)



Researchers use this 200-ft tower at the Georgia Institute of Technology to take air samples and study ground-level ozone. The outcome may lead to state limits on utility facilities and fleets in ozone non-attainment areas. Thirteen counties qualify in the Atlanta area.

The Environmental Protection Agency counts 97 U.S. ozone non-attainment areas and divides them into five categories, each with varied deadlines for filing plans and complying. Compliance deadlines start in 1993 (see table).

Study results

Results of the Southern Oxidants Study may help states limit ozone and comply with these federal standards. Universities, state and federal regulatory agencies, and electric utilities involved with the study are investigating trends related to ground-level ozone, and how weather and other variables contribute.

The study also aims to improve "mathematical models used to predict ozone formation and design control strategies," said one study participant.

Preliminary results are expected by late 1992. The full report may take two years to complete. The $10-million-a-year study started in 1991. Total funding may reach $50 million.

Increasing concern

Volatile organic compounds (VOCs) and nitrous oxides (NOx) react with sunlight to form ground-level ozone. While upper-atmosphere ozone protects life from ultraviolet sunlight, ground-level ozone has become an increasing air quality concern associated with breathing problems and slower plant growth.

VOCs occur naturally and, like NOx, also result from combustion of fossil fuels. Past efforts tried controlling VOCs, with little effect. Future controls seem likely to focus on NOx, sources said.

Atlanta chosen as one study site

Research in Atlanta involves more than 200 scientists, a 200-ft tower (photo), balloons and a helicopter to carry instruments. About a million air quality measurements and more than 3000 VOC samples will be taken from 14 area sites, according to John Toon at Georgia Institute of Technology. Collections started July 27.

Atlanta, along with other cities such as Chicago and Boston, are "serious" in the EPA's non-attainment ranking and must comply by 1999.

The program includes an educational outreach program to answer inquiries, and promote discussion and understanding of ground-level ozone issues, Toon noted.

Utilities, EPA, DOE get involved

Involved agencies and companies include Duke Power Co., Tennessee Valley Authority, The Southern Company, U.S. Environmental Protection Agency, Department of Energy, Electric Power Research Institute, National Oceanic and Atmospheric Administration, U.S. Geological Survey, and National Park Service.

LATE NEWS

Public health is protected by existing rules on wood-pole preservatives, PCBs, and mixed radioactive wastes, say utilities. Ratepayers would incur unnecessary costs if the EPA approves related rules in April '93 proposed under the Resource Conservation and Recovery Act, says the Utility Solid Waste Activities Group.

Portland General Electric will close the Trojan Nuclear plant in 1996, 15 years early, rather than replace steam generators. That least-cost option saves $100 million. A November ballot could close the plant immediately, costing $500 million more. The plant reopened in February after an 11-month shutdown from steam-tube cracks. PGE is operator and 67-percent owner. A Eugene, OR, municipal owns 30 percent; PacifiCorp owns the rest.

Conference committee works on energy bills

WASHINGTON—A conference committee will have to hurry to work out differences in two major energy bills from the House and Senate.

With less than 25 legislative days left in this Congress, it was unclear if the committee would forge a compromise in time. Key leaders, including President Bush, have been pushing for passage of national energy legislation. The Senate named its conferees in late July, but the House hadn't as of Aug. 11.

If the bill becomes law, the electric utility industry will have a new blueprint on a wide range of provisions, including energy efficiency, industry competitiveness, nuclear licensing, and, possibly, transmission access.

With final language subject to change, industry interests will have people camping outside conference committee doors and lining connecting corridors.

In late July, the Senate approved, 93-3, an amended version of the bill it passed in February. The bill now includes the Senate Finance Committee energy related tax provisions.

Coal benefits compromise

Intense Senate debate on retired coal-miner health care funds resulted in a compromise that would assesses some coal companies, rather than implement an industry-wide tax. The Senate also agreed to drop language removing Nevada oversight at Yucca Mountain to expedite site characterization.

The House bill contains language on third-party transmission access. The House version bans affiliate transaction under Public Utility Holding Company Act changes; the Senate prefers to give states leeway to decide.

State Deadlines for Non-Attainment Areas

EPA Ranking	Compliance Required	Some Cities within These Areas Include...
Marginal	11/15/93	Columbus, Birmingham, Tampa, Portland
Moderate	11/15/96	Cleveland, Cincinnati, St. Louis
Serious	11/15/99	Atlanta, Boston, Baton Rouge, Chicago
Severe	11/15/05	Houston, New York, Baltimore
Extreme	11/15/10	Los Angeles (only one)

Source: Environmental Protection Agency

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Report predicts global, green utilities, regional rate increases from IRP

WASHINGTON—21st century electric utilities may compete with "global power companies" that have "widely dispersed business centers," and with "green utilities" that use renewable resources as "real competitive weapons."

Unexpected regional increases in electricity prices also may result as regulators and utilities experiment with various resource options using integrated resource planning (IRP).

These are several views of the industry's future, according to "Electric Power Trends 1992," by Arthur Anderson and Cambridge Energy Research Associates.

New niche

"For many utilities," said Arthur Andersen's Leonard Kujawa, recent trends "may mean seeking a new market niche that could bring them competitive advantage."

Trends outlined in the report include:

- Increased state regulatory use of IRP. Utility management often must justify future and past actions using least-cost planning or IRP.
- More intense competition from non-utility generators. Maine, California, and Louisiana had 20 percent or more of their total generating capacity supplied by non-utility sources in 1990. The U.S. average was 7.7 percent in 1990. In response, utilities will continue developing partially unregulated affiliated power producers.
- Continued association between GNP and electric demand. Increasing electrification will mean higher electric demand even during recession.
- Growth in innovative and profitable demand-side management strategies.
- Continued cost containment, especially with increased competition and pressures for a cleaner environment. Three states, Indiana, Ohio, and West Virginia have 40 percent or more capacity targeted under the Clean Air Act Amendments of 1990.
- A shift from resource-driven to market-driven utility management.

Regulatory Incentives for DSM Investments by State

	Some Incentive(s) in Place By...		Types of Incentives Used			
	1989	1991	Balancing Account for DSM Expenses	Rate-Basing	Recovery of Lost Revenue	Bonus
California		●	●	●	●	●
Colorado		●		●		●
Connecticut	●	●		●	●	●
Florida		●	●	●		
Idaho	●	●		●		●
Illinois		●	●		●	
Indiana		●			●	●
Iowa	●	●				●
Kansas		●		●		●
Maine	●	●	●	●	●	●
Maryland		●	●	●	●	●
Massachusetts	●	●	●	●	●	●
Michigan		●	●	●		●
Minnesota		●		●	●	
Montana		●		●		●
Nevada		●		●		
New Hampshire		●	●		●	●
New Jersey		●			●	●
New York	●	●	●	●	●	●
Ohio		●	●		●	●
Oklahoma		●		●		
Oregon		●		●	●	●
Pennsylvania		●		●		
Rhode Island	●	●	●			●
Texas		●		●		●
Vermont	●	●	●	●	●	●
Washington	●	●	●	●	●	●
Wisconsin	●	●	●	●		

By late 1991, 28 states had some regulatory incentive in place for demand-side management (DSM) programs.

Source: "Electric Power Trends 1992," Arthur Andersen/Cambridge Energy Research Associates

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State regulators want more SO_2 education, electric research

SEATTLE—State regulators want investor-owned utilities to invest more in electric power research and development, encouraging a nationwide goal of 1 percent of electric revenues. Just 0.4 percent of investor-owned revenues was invested in R&D in 1987, regulators said.

The move followed a regulatory study that said U.S. utilities have fallen behind when compared to other U.S. industries and electric power research investments in other countries.

The encouragement was in a resolution from the National Association of Regulatory Utility Commissioners' Executive Committee at the NARUC Summer Committee Meetings, July 26-30.

Nuclear waste, workforce, SO_2

NARUC also passed resolutions on SO_2 allowance trading education, encouraging more women and minority hiring at utilities, and on monitoring the high-level nuclear waste storage program.

A study released by a NARUC subcommittee suggested the need for more investment in electric power research.

"Electric utilities spend less on R&D [per unit of GNP] than almost every U.S. industry and less than utilities in most industrialized nations," said Electricity Committee Chairman Ashley Brown, an Ohio commissioner, speaking in favor of the resolution.

"We ought to be doing more in investing in the future," Brown said.

The resolution didn't direct the funds toward any particular research body. Separately, some commissioners offered praise for Electric Power Research Institute efforts.

The R&D report said that U.S. industry spends an average of 3.4 percent of revenue on R&D, while the investor-owned electric utility industry spends just 0.4 percent on electric R&D.

The report, by NARUC's Ad Hoc Subcommittee on Electric R&D Funding, also noted a "59 percent decline in U.S. expenditures on energy R&D per unit of GNP from 1981 to 1987."

The U.S. did spend the most in quantity, the report said. The second in amount was Japan, spending 39 percent of what the U.S. did in 1987.

The report said, "The United States appears to be losing ground in funding both total R&D and energy R&D when compared with funding by other countries on a per unit of GNP basis....There is increasing concern that the United States' dominance in research capacity and output will be lost to foreign nations and that we will become a net importer of research."

New York promoted spending 1 percent of revenue on R&D as early as 1971, the report said. More recently, that state commission said it would consider full rate recovery of up to 2 percent for R&D.

State funding to NARUC's research arm, the National Regulatory Research Institute, has not been at its full potential, the report noted. In addition, a speaker from Electricite de France estimated that his utility, the largest in Europe, spends about 5 percent of revenue on R&D.

In the resolution, regulators suggested utilities establish research priorities. R&D reimbursed through rates should be based on revenue requirements of a well-documented research plan. NARUC also suggested programs should be monitored for benefits and R&D funds used for only R&D.

Other resolutions

NARUC resolutions provide policy guidelines to states, but do not bind them. Among the other resolutions passed, NARUC:

- Supported and encouraged a Pennsylvania Public Utility Commission conference to help regulators, the academic community, media and the industry understand SO_2 trading. The intent is to build public and environmental group support for allowance trading as a way to promote least-cost compliance with the Clean Air Act Amendments of 1990.
- Encouraged greater employment opportunities for women and minorities at commissions and among the utilities and carriers commissions regulate.

According to 1991 U.S. Bureau of Labor Statistics, the average U.S. workforce employs 45.6 percent women, 10.1 percent blacks, and 7.5 percent Hispanics. The public utility sector—electric gas, water & sewer and combination utilities—employs 20.7 percent women, 11.5 percent blacks, and 5.1 percent Hispanics.

- Closed its Nuclear Waste Assessment Office, started in 1990, after two years of funding by more than 20 state commissions. Leftover funding will help reopen an expanded office. NARUC hopes the Department of Energy will fund the new office to assess the activities of the federal high-level nuclear waste disposal program. Suggested funding would come from the nuclear waste fund, rather than from states or taxes. Another resolution honored the work of Ronald Callen, Michigan regulatory staff, who ran the office for two years.

Idaho Power plugs customers into the sun

BOISE, ID—Idaho Power Co. plans to design, own, and maintain solar photovoltaic systems and charge customers a flat fee where doing so is more economical than extending power lines.

If state regulators approve, Idaho Power would be the first U.S. investor-owned utility with such a program, the utility said.

Idaho Power capped its total investment in the three-year pilot project at \$5 million, with the maximum single system cost of \$50,000.

A small PV system serving a single residential customer is projected to cost approximately \$10,000, the company said. Such a customer's ongoing monthly payment to Idaho Power would be about \$160.

The cost for the system and the monthly charge would vary according to the power requirement of the site. Likely sites might include remote residences, vacation homes, stock watering wells, sign lighting, and communication sites.

Any new source as little as a half mile from existing power lines might be economical for solar applications. The company listed average power line construction cost at \$20,000 per mile. Costs are higher in rugged terrains.

A system would include solar panels, batteries and possibly a back-up generator in case of lengthy cloud cover. All equipment would remain the utility's property.

Joseph W. Marshall, Idaho Power chairman and chief executive officer, said the program should provide "manufacturers with the assurances of new markets that will encourage them to invest in new manufacturing equipment, and to continue the ongoing trend of declining costs for solar PV products."

Idaho Power believes, Marshall continued, "there are many cost effective applications for solar PV technology."

COMMENTARY

Publicly owned utilities count with us, too

T.D. Kilgore, president and CEO of Oglethorpe Power Corp., a large power cooperative based in Tucker, GA, recently wrote *EL&P* a letter complaining that our coverage of the "top 100 electric utilities" is misleading because only investor-owned companies are included.

Said Kilgore, "I am sure that you are aware that municipal and cooperative electric systems provide service to tens of millions of Americans. Yet there is no mention of these electric utilities in your list." He asks if we would consider publishing a parallel article on the top cooperative and municipal utilities.

Mr. Kilgore is correct. The "Top 100 Electric Utilities 1992 Financial Performances" article that appeared in the June 1992 issue of *Electric Light & Power* and the "Top 100 Electric Utilities 1992 Operating Performances" article in this issue cover only investor-owned utilities. While that is clearly stated in the opening of the article, the headline is somewhat misleading. (The "top 100" companies are determined by kWh sales.)

Since it is impossible to compare investor-owned and publicly owned companies by common financial measures—the thrust of the June article—we have tried, in the past, to cover publicly owned companies and cooperatives in separate articles with measures suited to each type of company. Our goal was to do an article measuring individual company performances in the preceding calendar year. Getting the information was the problem. Most of the easily obtainable data on electric companies, such as information from the federal government, is not available that soon. So we used questionnaires mailed to each company augmented by the investor-owned companies' Uniform Statistical Reports and FERC Form 1 reports obtained from each company as data sources.

It is difficult to get enough uniform and timely data on enough companies to do these types of articles. In fact, it proved impossible for the publicly owned companies and cooperatives. Too many cooperatives just did not cooperate.

On the other hand, it has been possible to get the data from most of the investor-owned companies. Apparently, the IOUs are used to putting together the Uniform Statistical Reports and FERC Form 1s by July or August of the following year and they seem more willing, or better able, to fill out a questionnaire earlier in the year providing financial data. So, we have continued publishing the IOU top 100, but were forced to drop the comparable publicly owned reports some years ago.

So, where do we go from here? A more precise headline on the Top 100 IOU reports would be a step in the right direction. However, it remains desirable to do similar reports on publicly owned utilities and cooperatives. I am pursuing Mr. Kilgore's offer to help structure such articles and obtain information. Do you have any ideas?

Robert W. Smock, Editorial Director

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LETTERS

Publicly owned utilities

I would like to register a complaint over your June article entitled, "The Top 100 Electric Utilities." This misleading title suggests that all electric utilities were considered, when, in fact, only investor-owned companies are featured.

I am sure that you are aware that municipal and cooperative electric systems provide service to tens of millions of Americans. Yet, there is no mention of these electric utilities in your list.

Would you consider publishing a parallel feature that focuses on cooperative and municipal utilities? Oglethorpe Power Corp. would be glad to assist in gathering and formatting the first set of data to help make this task easier.

You have been gracious in your coverage of many news items relating to electric cooperatives in general and Oglethorpe Power in particular. We are grateful for this coverage and respectfully request that you consider our suggestion as one that could improve the quality of your publication and enhance service to your many readers.

T.D. Kilgore
President and CEO
Oglethorpe Power Corp.

WEPCo keeps Milwaukee

Competition is a hot issue in the electric utility industry, as you are well aware. Fortunately, competition hasn't affected Wisconsin Electric Power Co. to the degree the July issue of *Electric Light & Power* indicated.

The first paragraph in the article "WP&L, PEPCO take top honors in *EL&P*'s third annual substation design competition," states that "WP&L serves southern Wisconsin, including Milwaukee." The next paragraph refers to a connection point at a rural 138-kV substation "outside Milwaukee".

While we applaud WP&L's award for its substation design, we are not about to award them the city of Milwaukee, the site of Wisconsin Electric Power Co.'s headquarters.

Wisconsin Electric serves the Milwaukee area, as well as most of southeastern Wisconsin, portions of east-central and northern Wisconsin, and a large share of Michigan's Upper Peninsula. But the closest WP&L comes to Milwaukee is about 40 miles from the city, and close only counts in horseshoes.

John Bartel
Senior Public Information Rep.
Wisconsin Electric Power Co.

Larger than Linden plant

To the best of my knowledge, the 663-MW Doswell Limited Partnership combined-cycle electric generating facility is now the largest operating non-utility generator in the United States. Certainly, it is larger than the (614 MW) Linden Cogeneration plant profiled in *EL&P*'s May 1992 issue. Doswell, in Hanover County, VA, started commercial operation May 9, 1992.

August Wallmeyer
Wallmeyer Communications
for Doswell Limited Partnership

NEWS BRIEFS

JILL MINNER, Assistant Editor

FERC approves merger of Iowa Power, IPS

The Federal Energy Regulatory commission has approved the merger of Iowa Power Inc. of Des Moines, IA, and Iowa Public Service Co. of Sioux City, IA, to form Midwest Power Systems Inc. "We're pleased that FERC has approved the merger. We have felt the case for merging the utilities is a strong one and regulatory agencies agree," stated Midwest Power Systems Chairman and CEO Russell Christiansen. The merged utility has two operating divisions, Midwest Power and Midwest Gas, according to parent company Midwest Resources. Christiansen says the merger will provide greater rate stability and estimates savings of nearly $89 million through the year 2001. "We now have the ability to move ahead with a stronger, more efficient utility operation that will result in long-term benefits for customers and shareholders," he added.

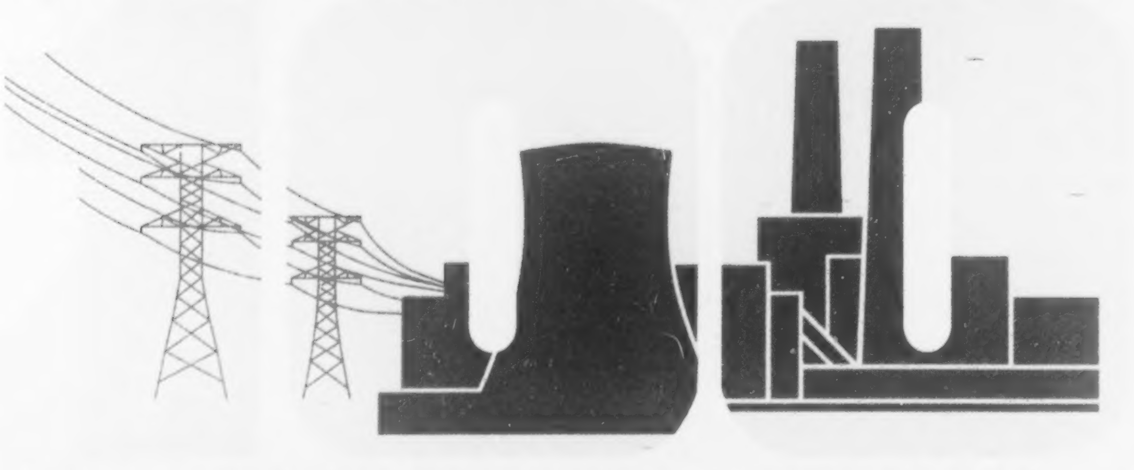
Bush appoints Waters chairman of TVA

President Bush has appointed John Waters chairman of the Tennessee Valley Authority. Waters, an attorney and former federal co-chairman of the Appalachian Regional Commission, succeeds Marvin Runyon who has moved on to become U.S. Postmaster General. "I appreciate the confidence the President has shown in appointing me to serve as TVA Chairman," said Waters. "I look forward to applying my experience on the board to strenghthen TVA's partnerships with the people we serve." Waters participated in TVA business decisions leading to five years of rate stability, and spearheaded TVA's nuclear recovery effort, according to TVA.

SMUD commits to 400 MW of renewables

The Sacramento Municipal Utility District said it has launched several solar programs and plans to test a wide range of new solar technologies to add 400 MW of cost-effective renewable energy resources this decade. "By using a free energy source like the sun to generate electricity, we can avoid having to use non-renewable resources," explained SMUD General Manager S. David Freeman. SMUD's residential solar programs include water heating, air conditioning, electricity generation and solar building design. Working with Sandia National Labs and the National Renewable Energy Laboratory, SMUD says it will test advanced evaporative cooling systems, solar absorption and desiccant cooling in Sacramento, CA, homes. Commercially, SMUD has operated a 2-MW photovoltaic plant since 1984, and is part of an industry consortium building a central receiver solar thermal 10-MW power plant in the California desert.

THE TOP 100 ELECTRIC UTILITIES



1991 OPERATING PERFORMANCES

Season peaks are down, capabilities are up

Henry Stein
Senior Editor—Power Production

Because of 1991's milder weather, the overall average seasonal peak output for the largest investor-owned electric utilities which reported to *EL&P* both for 1990 and 1991 went down, but by less than 1 percent. Because the utilities added more system capability, they increased their average reserve margin by 4 percent. At the same time, their median heat rate dropped less than 1 percent.

TABLE 1. PEAK DEMAND AND RESERVE MARGINS

	1990	1991	Change
Seasonal Peak (MW)	405,062	404,110	-0.2%
Total System Capability (MW)	479,266	490,970	2.4%
System Reserve Margin	18.3%	22.3%	
Total Owned Capability (MW)	444,209	455,062	2.4%
Average Load Factor	58.2	59.3	

Peak demand, reserve margins

The 0.2-percent decrease in peak out put for the Top 100 (Table 1) was less than the 1.1-percent gain in their annual kilowatthour sales reported by *EL&P* in June. This difference suggests that not only did customers use energy efficiently throughout the year, they also managed to cut back at high-usage times.

The 1990-1991 decrease in system peak continued the 1989-1990 decrease of 2.3 percent.

This '90-'91 Top 100 *decrease* was much different than the North American Electric Reliability Council's (NERC's) reported '90-'91 summer peak *gain* of 1.1 percent and winter *growth* of 2.9 percent. Perhaps the large investor-owned utilities reporting to *EL&P* had found a better way to handle peak demands.

The companies seeing the largest percentage gains in their peak outputs were: Consolidated Edison Co. of New York and Atlantic Energy Inc., each with a 10-percent increase; Central Hudson Gas & Electric Corp., United Illuminating Co., Orange & Rockland Utilities and Delmarva Power & Light Co., each with a 9-percent gain; and Baltimore Gas & Electric Co., General Public Utilities and Public Service Co. of Colorado, each at 8 percent.

Those companies reporting the largest drops in seasonal peaks from 1990 to 1991 were: Portland General Electric Co., with a drop of 15 percent; Montana Power Co. at 9 percent; PacifiCorp at 8 percent; and Washington Water Power Co., with a drop of 7 percent.

The change in reserve margin of *EL&P*'s Top 100 also reversed for those companies reporting in both years. However, the reserve margin increased 4.0 percent 1990-91, after decreasing 1.1 percent 1989-1990.

TABLE 2. TOP GENERATING UNITS BY HEAT RATE
(capac. factor >50%)

Rank & Unit	Capacity (MW)	Reporting Company	Heat Rate (Btu/kWh)
1 Canal -1	572	Commonwealth Energy System	8,841
2 Marshall -4	660	Duke Power	9,029
3 Brayton Point -3	585	New England Electric	9,073
4 Morgantown -2	582	Potomac Electric Power	9,145
5 Kintigh -1	601	NYS Electric & Gas	9,207
6 Belews Creek -2	1120	Duke Power	9,231
7 J M Stuart -2	205	DPL	9,268
8 St Johns River -2	125	FPL Group	9,283
9 Monroe -3	750	Detroit Edison	9,296
10 Crystal River-4	717	Florida Progress	9,297
11 Maalaea Maui -M10	14	Hawaiian Electric	9,301
12 Maalaea Maui -M11	14	Hawaiian Electric	9,301
13 Maalaea Maui -M12	14	Hawaiian Electric	9,301
14 Maalaea Maui -M13	14	Hawaiian Electric	9,301
15 Bowen -4	877	Southern Company	9,307
16 Ft. Martin -2	555	Allegheny Power System	9,308
17 Crystal River -5	717	Florida Progress	9,318
18 Belews Creek -1	1120	Duke Power	9,320
19 Eastlake -5	411	Centerior Energy	9,323
20 J H Campbell -3	719	CMS Energy	9,333

The average reserve margin of those reporting was 22.3 percent in 1991, which was almost exactly the same as NERC's estimate.

The upswing in reserve margin for the Top 100 could be viewed as good news for the country, since it followed two years of decline in the figures. Many utilities and associated groups, such as NERC and the Edison Electric Institute (EEI), have expressed concern at decreasing U.S. reserve margins.

Those with the largest reserve margins were led by Public Service Co. of New Mexico, which showed a 66-percent margin; Eastern Utilities Associates and Central Maine Power Co., which were at 46 percent, Pacific Gas & Electric Co. at 45 percent; and Oklahoma Gas & Electric Co. with 41 percent. The rest fell below 40 percent.

Those with the lowest reserve margins were located mainly in the Northeast and Midwest. They included: Tucson Electric Power Co. which reported a -1 percent margin; Philadelphia Electric Co. with a 5 percent margin; WPL Holdings Inc., Public Service Co. of Colorado, and Unitil Corp. with 7 percent.

A large part of the overall reserve margin increase can be attributed to the utilities adding 430.1 GW, or 5.7 percent, to their generating capability. In addition, their average load factor rose from 58.2 percent in '90 to 59.3 percent in '91.

And 98 utilities (not all in the Top 100) reported plans for capacity additions to EL&P for the January 1992 forecast report. Their plans add up to much more capacity than the 78 utilities that were planning additions as of January 1991.

Interestingly, more than half of the planned '92 utility additions were to have capacities of less than 100 MW.

EEI forecast in July that total construction expenditures for investor-owned utilities would be 886.9 billion for the three years 1992-1994. This would be an 8.0 percent increase above the institute's forecast for last year for years 1991-1993. Both forecasts included Allowance for Funds Used During Construction (AFUDC).

But EEI also said AFUDC expenditures were projected to remain steady during the '92-'94 period at about 81.3-billion annually. AFUDC represented only 4.9 percent of total utility plant expenditures in '91, the organization added, which was down from an all-time high of 22.5 percent in 1984.

Meanwhile, EEI reported non-utility generator (NUG) capacity made up 8 percent of the U.S. total in 1991. During the '90s, NUGs are expected to provide an additional 26 GW, or nearly one-fifth of capacity additions, said EEI.

Heat rates

There was a slight improvement in median heat rate achieved by the Top 100 answering the survey. The '90-'91 decrease from a rate of 10,601 to 10,[illegible]23 Btu/kWh, though minor, did reverse the upward movement shown in last year's report. However, the smallness of the drop reinforced the idea that heat rate improvements have been bottoming out in recent years.

Median heat rates fell every year for seven years ('82-'88), then went up and down in small increments for the next three years ('88-'90), and now were driven down again, but by less than 1 percent.

TABLE 3. TOP SYSTEM HEAT RATES, CONVENTIONAL FOSSIL-FUELED BOILERS

Company	Heat Rate (Btu/kWh)
1 Commonwealth Energy System	9,336
2 Duke Power	9,448
3 American Electric Power	9,575
4 CMS Energy	9,671
5 New York State Electric & Gas	9,841
6 Dominion Resources	9,844
7 Cincinnati Gas & Electric	9,876
8 Potomac Electric Power	9,885
9 DPL	9,908
10 United Illuminating	9,916

Some system heat rate leaders switched rankings again in 1991 (Table 4). Commonwealth Energy System held onto first place with a heat rate of 9379 Btu/kWh, but Cincinnati Gas & Electric Co. moved up into the No. 2 spot from No. 3 with a rate of 9886 Btu/kWh, and New York State Electric & Gas jumped from No. 6 to No. 3 with a rate of 9898 Btu/kWh. DPL retained its No. 4 position, and Eastern Utilities Associates, a

TABLE 4. HEAT RATES, PEAKS, RESERVES, AND FUEL CONSUMPTION

								Fuel Consumption			
Rank/Company	Heat Rate (Btu/kWh)	Peak Demand (MW)	Change (%)	Winter or Summer (W or S)	System Capability at time of Peak (MW)	System Reserve Margin (%)	Load Factor (%)	Coal (1000 tons)	Oil (1000 bbl)	Gas (1000 MCF)	Other
1 Commonwealth Energy System (H)	9,379	909	2	S	1,148	28	61.8	0	7,738	1,387	0
2 Cincinnati Gas & Electric	9,886	4,161	5	S	4,809	16	57.6	8,745	0	147	0
3 New York State Electric & Gas	9,898	2,471	-1	W	3,152	28	69.0	6,310	29	0	0
4 DPL (H)	9,912	2,730	3	S	3,017	11	59.0	5,717	79	237	0
5 Eastern Utilities Associates (H)	9,922	879	3	S	1,287	46	61.0	357	2,908	0	0
6 Potomac Electric Power	9,925	5,769	6	S	6,285	9	52.2	6,471	4,302	9,456	0
7 American Electric Power (H)	9,953	17,556	5	S	23,397	33	66.5	43,254	506	0	0
8 Allegheny Power System (H)	9,956	6,238	3	W	7,715	24	71.7	16,402	0	0	0
9 Detroit Edison	9,980	8,980	-1	S	10,121	13	55.9	18,852	291	18,532	0
10 United Illuminating	9,986	1,146	9	S	1,474	29	56.2	840	4,520	2,840	0
11 Duke Power	9,996	14,677	4	S	17,587	20	69.4	9,878	106	113	0
12 New England Electric (H)	9,998	4,250	5	S	5,661	33	60.5	3,570	6,589	1,637	0
13 Southwesten Public Service	10,003	3,097	-5	S	4,012	30	63.7	7,775	4	50,137	959
14 Florida Progress (H)	10,007	6,056	2	W	6,971	15	53.5	5,569	11,118	1,727	0
15 Southern Company (H)	10,022	25,261	-3	S	28,311	12	58.3	44,361	289	8,819	20
16 CMS Energy (H)	10,048	6,084	3	S	7,207	18	62.4	7,314	536	266	0
17 CILCORP (H)	10,092	1,074	-2	S	1,216	13	58.0	2,333	0	13	0
18 PSI Resources (H)	10,120	4,756	4	S	5,705	20	57.4	12,331	13	0	0
19 Green Mountain Power	10,126	309	2	W	415	35	85.8	18	1,188	1,821	0
20 SCANA (H)	10,146	3,300	2	S	4,007	21	57.0	4,350	23	9,660	0
21 Central Hudson Gas & Electric	10,164	980	9	S	1,094	15	62.6	874	3,439	4,143	0
22 TECO Energy (H)	10,175	2,717	3	S	3,248	20	60.3	6,682	651	152	0
23 Idaho Power	10,237	2,125	-2	S	2,541	20	66.0	3,097	1	0	0
24 FPL Group (H)	10,280	14,123	3	S	16,053	14	59.1	849	32,396	136,374	211
25 Dominion Resources (H)	10,295	12,939	-7	S	14,863	15	56.0	10,107	2,942	9,392	153
26 Boston Edison	10,319	2,652	4	S	3,659	38	60.0	0	5,477	26,686	0
27 Pennsylvania Power & Light	10,326	5,974	6	W	7,797	31	63.6	10,192	3,375	0	0
28 General Public Utilities (H)	10,332	8,271	8	S	9,782	18	61.1	7,144	9,629	12,529	0
29 Union Electric	10,348	6,957	-2	S	7,953	14	55.7	10,763	19	1,295	0
30 KU Energy (H)	10,352	2,894	2	S	3,426	18	58.4	6,057	2	5	22
31 LG&E Energy (H)	10,363	2,125	-1	S	2,698	27	53.9	5,202	0	18	0
32 Niagara Mohawk Power	10,369	6,093	5	W	7,964	31	69.1	3,372	9,623	22,045	0
33 PacifiCorp	10,376	7,019	-8	W	8,511	21	70.0	23,826	98	5,104	0
34 Portland General (H)	10,388	3,136	-15	W	4,075	30	61.2	1,188	21	10,839	0
35 Pacific Gas & Electric	10,404	15,839	NA	S	22,892	45	60.5	0	661	218,767	0
36 Orange & Rockland Utilities	10,421	1,001	9	S	1,188	19	50.9	738	1,123	11,047	1,000
37 DQE (H)	10,425	2,402	NA	S	2,798	16	60.3	4,584	50	204	0
38 Carolina Power & Light	10,436	8,471	4	S	9,867	16	56.2	8,066	177	138	1,630
39 SCEcorp	10,447	16,709	-5	S	20,875	25	56.5	5,436	113	143,302	0
40 IPALCO Enterprises (H)	10,455	2,583	3	S	2,883	12	56.4	6,001	55	0	11
41 Central & South West (H)	10,461	10,203	-2	S	13,864	38	60.4	17,449	279	240,711	0
42 Centerior Energy (H)	10,461	5,361	2	S	6,308	18	62.9	7,294	287	16	0
43 Houston Industries (H)	10,465	10,908	-2	S	14,528	33	61.9	17,177	48	237,272	0
44 Oklahoma Gas & Electric	10,475	4,310	-6	S	6,057	41	50.3	7,422	26	80,473	0
45 WPL Holdings (H)	10,492	1,863	4	S	2,002	7	62.0	4,409	20	508	0
46 Gulf States Utilities	10,494	5,224	-3	S	6,371	22	66.5	2,344	21	168,285	0
47 Illinois Power	10,520	3,272	-4	S	3,890	19	55.2	6,380	166	3,298	0
48 Ohio Edison	10,523	5,513	2	S	6,212	13	64.2	10,365	14	46	0
49 Tucson Electric Power	10,550	1,319	-3	S	1,309	-1	58.2	3,070	0	2,056	0
50 San Diego Gas & Electric	10,556	2,890	NA	S	3,971	37	56.0	0	213	37,882	0
51 Rochester Gas & Electric	10,567	1,297	7	S	1,592	23	60.8	734	467	79	0
52 Washington Water Power (H)	10,579	1,472	-7	W	1,603	9	57.0	1,709	6	6	388
53 Kansas City Power & Light	10,589	2,751	1	S	3,090	12	49.2	6,056	58	735	0
54 Midwest Resources (H)	10,602	2,239	-2	S	2,769	24	517	5,973	26	1,859	0
55 Pinnacle West Capital (H)	10,613	3,532	-4	S	4,097	16	58.9	6,488	49	6,906	0
56 CIPSCO (H)	10,619	1,689	2	S	2,354	39	57.7	4,558	26	0	0
57 Northern States Power	10,665	7,080	5	S	7,903	12	56.2	11,226	88	1,383	640
58 Central Louisiana Electric	10,684	1,233	1	S	1,706	38	59.3	2,369	0	29,487	0
59 Baltimore Gas & Electric	10,695	5,910	8	S	6,608	12	52.4	4,628	3,037	6,474	0
60 Delmarva Power & Light	10,707	2,430	9	S	2,645	9	58.8	2,277	2,931	9,349	0
61 Public Service of Colorado	10,718	3,907	8	S	4,168	7	70.1	7,27[illegible]	59	2,412	0
62 Atlantic Energy (H)	10,719	1,911	10	S	2,074	9	51.3	1,0[illegible]	526	5,165	0
63 NIPSCO Industries (H)	10,725	2,496	-2	S	3,382	35	62.7	6,438	0	7,235	0
64 Wisconsin Public Service	10,732	1,592	5	S	1,721	8	68.9	3,747	12	470	0
65 Public Service Enterprise Group (H)	10,739	9,086	NA	S	10,713	18	50.9	3,343	2,232	44,276	0
66 Hawaiian Electric (H)	10,768	1,446	3	W	1,780	23	71.0	0	12,104	0	0
67 Philadelphia Electric	10,772	7,096	5	S	7,436	5	57.5	2,573	2,158	1,526	0
68 Consolidated Edison	10,794	9,242	10	S	11,043	19	48.1	0	14,909	117,972	0
69 UtiliCorp United	10,808	1,623	NA	S	3,762	132	54.3	1,954	27	2,373	0
70 Sierra Pacific Power	10,842	979	-1	S	1,088	11	73.3	839	380	15,922	0
71 Texas Utilities (H)	10,847	16,952	-6	S	21,849	29	58.9	30,372	107	335,836	0
72 Entergy (H)	10,857	11,852	-3	S	14,676	24	60.2	6,794	676	198,302	48
73 Southern Indiana Gas & Electric	10,918	996	1	S	1,238	24	52.0	2,670	0	192	0
74 Minnesota Power	10,923	1,306	5	W	1,573	20	82.0	3,206	0	0	0
75 Iowa-Illinois Gas & Electric	10,936	1,050	0	S	1,300	24	55.0	2,613	8	350	0
76 Puget Sound Power & Light	10,949	4,073	-12	W	4,661	14	55.0	3,451	3	115	0
77 Montana Power	10,962	1,362	-9	W	1,547	14	70.0	4,022	8	82	8
78 Nevada Power	10,977	2,373	6	S	2,625	11	48.9	2,602	61	3,991	0
79 St. Joseph Light & Power	10,983	325	0	S	416	28	52.6	583	45	828	0
80 Commonwealth Edison	11,009	17,733	3	S	22,359	26	53.2	10,364	2,466	467	486
81 Kansas Gas & Electric	11,044	1,751	1	S	2,421	38	53.1	2,925	3	16,503	0
82 Public Service of New Mexico	11,098	1,018	-3	S	1,691	66	65.6	3,133	0	44	0
83 Interstate Power	11,099	904	1	S	1,124	24	64.6	2,118	18	1,659	0
84 TNP Enterprises (H)	11,102	NA	NA	NA	NA	NA	NA	1,430	0	620	0
85 IES Industries (H)	11,127	1,606	4	S	1,944	21	61.8	2,907	26	9	930
86 Empire District Electric	11,277	678	1	S	812	20	54.0	1,337	8	1,130	0
87 Northwestern Public-Servica	11,292	251	NA	S	297	18	46.9	895	7	36	7
88 KPL Gas Service	11,306	2,077	1	S	2,485	20	41.9	5,889	14	4,063	0
89 Central Maine Power	11,443	1,416	-3	W	2,069	46	78.2	0	1,817	0	0
90 Otter Tail Power	11,538	555	-1	W	729	31	64.7	2,056	2	0	11
91 Bangor Hydro-Electric	11,746	264	5	W	362	37	73.0	0	104	0	0
92 Madison Gas & Electric	11,831	523	1	S	625	20	54.0	849	2	780	13
93 Central Vermont Public Service	11,836	399	3	W	466	17	66.5	33	21	219	33
94 MDU Resources Group, Inc.	12,110	387	1	S	454	17	54.2	1,563	4	189	6
95 UNITIL (H)	13,837	246	NA	S	264	7	61.8	0	131	229	0
96 Upper Peninsula Energy (H)	13,953	137	NA	W	188	37	70.1	61	4	0	0
97 Wisconsin Energy (H)		INFORMATION NOT PROVIDED BY COMPANY									
98 Long Island Lighting		INFORMATION NOT PROVIDED BY COMPANY									
99 Citizens Utilities		INFORMATION NOT PROVIDED BY COMPANY									
100 Northeast Utilities (H)		INFORMATION NOT PROVIDED BY COMPANY									

(H) - Holding company
NA - Not Available/Not Applicable

0 (in change columns) - Less than 1% change and/or zero in both years

new entity to the list, took the No. 5 spot.

Potomac Electric Power Co. was No. 6; American Electric Power Co. Inc. was No. 7; Allegheny Power System Inc., No. 8; Detroit Edison, No. 9; and United Illuminating held onto the No. 10 place.

When it came to generating units with the best heat rates (Table 2), Commonwealth Energy's Canal-1 became No. 1 (from No. 5 in '90) with 8841 Btu/kWh, followed by Duke Power's Marshall-4 in No. 2 at 9029 Btu/kWh, and then New England Electric's Brayton Point-3, Potomac Electric Power Co.'s Morgantown-2, and Duke Power Co.'s Belews Creek-2.

DPL's J M Stuart-2 was in the No. 6 spot, followed by FPL Group Inc.'s St. John's River-2, Detroit Edison's Monroe-3, Florida Progress Corp.'s Crystal River-4, and Hawaiian Electric Co. Inc.'s four Maalaea Maui units that the company said all had heat rates of 9301 Btu/kWh.

As a comparison, the top spot with the best average heat rate for all conventional fossil-fueled boilers (Table 3) went to Commonwealth Energy with a rate of 9336 Btu/kWh. This was closely followed by Duke Power's 9448 Btu/kWh, American Electric Power Co. Inc. at 9575, CMS Energy Co. at 9671, and New York State Electric & Gas at 9841.

The rest of the top 10, in order, were Dominion Resources Inc., Cincinnati Gas & Electric Co., Potomac Electric Power Co., DPL Inc., and United Illuminating Co.

Fuels used

Fuels used by the Top 100 in their generating plants included coal, oil, and natural gas (Table 4). "Other" fuels included wood, biomass, and refuse.

From '90 to '91, the reporting companies increased use of fossil fuels—coal consumption stayed almost the same, at approximately 560-million tons; but oil consumption increased by 2.6 percent, to about 156-million bbl, and natural gas usage went up by 7.8 percent, to more than 2299-billion ft^3.

For comparison, EEI reported that all investor-owned utilities (IOUs) decreased coal consumption by less than 1 percent, increased oil burned by 2.9 percent, and increased natural gas used by less than 1 percent.

The Energy Information Administration (EIA) predicted that almost 45-50 percent of the new capacity added by the turn of the century will be fueled by natural gas or oil. EIA also predicted that after year 2000, 40-50 percent of new capacity will burn coal.

In addition, the agency differed from both *EL&P* and EEI in noting that all utilities decreased oil consumption in '91 by 19 percent compared to '90.

Type of generation

Overall, the Top 100 added 2.4 percent to their owned capability between the end of 1990 and the end of 1991 (Table 5). Of this, approximately 317 GW, 69.7 percent, was produced from conventional steam generation, 15.8 percent with nuclear generation, 7.8 percent with combustion turbines (and their variation, combined cycle), 5.9 percent from hydrogeneration, and less than 1 percent with other types of generation. These "Other" types included wind, solar, and geothermal.

Those companies increasing their owned capabilities the most included: UtiliCorp United Inc., which listed an

1991 OPERATING PERFORMANCES

increase of a whopping 67.1 percent; Cincinnati Gas & Electric, increasing its amount by 14.9 percent; DPL Inc., with an increase of 13.8 percent; Nevada Power Co., with 11.9 percent; and Baltimore Gas & Electric Co., up 10.6 percent. All the others showed additional owned capabilities of less than 10-percent each.

Large decreases in owned capability were reported by: Green Mountain Power Corp., which lost 18.9 percent; Portland General Electric Co., down by 12.1 percent; and Central Maine Power Co., which dropped 9.2 percent.

Capability aside, the drought affecting many parts of the country is expected to cause a drop in hydro production for the current year.

The "wild card," so to speak, is nuclear power. The utilities, nuclear suppliers, and government agencies are counting on the new initiatives begun in recent years to bear fruit shortly and result in new nuclear plants being built.

So far, however, no electricity generator—be it investor-owned utility, cooperative, municipal, or federal power authority—has been willing to state publicly that it definitely plans to be the first to place such an order.

The Nuclear Regulatory Commission is pushing for its new, simpler licensing process. Meanwhile, the industry is working hard on simpler, safer reactors. Recent surveys by a not-entirely-disinterested U.S. Council for Energy Awareness seem to point to public opinion turning in the industry's favor.

Transmission & distribution

On the electricity delivery side, the companies reporting in both years added more than 3000 miles of transmission lines to their systems in 1991, for an almost 1-percent gain (Table 5). The addition of over 45,000 miles of distribution line represented almost a 2-percent gain in total mileage.

The utility adding the most transmission mileage was UtiliCorp United, which reported 2,993 additional circuit miles to its system for 1991. No other utility came close to increasing transmission miles by this amount.

Southern Company, however, did add the next highest number of miles to its transmission system, with 316 new circuit miles. It was followed in this regard by Southwestern Public Service Co., which added 158 miles to its transmission line total.

UtiliCorp also led with the most distribution miles added, 7,220. It was followed in this category by Houston Industries, which added 5,539 more miles of distribution line; IES Industries at 4810 miles; and then by Union Electric Co. with 4,424 miles. None of the other reporting companies added nearly these numbers of distribution mileages.

However, Duke Power did add 1849 miles of distribution lines; New York State Electric & Gas put in 1783 miles; Commonwealth Edison added 1565 miles; Allegheny Power System added 1510 miles; General public Utilities Corp. added 1361 miles; American Electric Power put in 1276 miles; and Niagara Electric Power Corp. added 1267 more distribution miles.

Those companies reporting fewer distribution miles in their systems included: PSI Resources Inc., at 1505 fewer distribution miles of lines; and Minnesota Power Corp., with 991 fewer miles.

Table 5. 1991 Operating Facilities

	Type of Generation					Total		Power Delivery			
Company	Conventional Steam (MW)	Nuclear (MW)	Combustion Turbine (MW)	Hydro & P.S. (MW)	Other (MW)	Owned Capability (MW)	Capability Change (%)	Transmission (circuit miles)	Miles Added	Distribution (miles)	Miles Added
Allegheny Power System (H)	7,089	0	0	903	0	7,992	0.0	4,675	25	59,349	1,510
American Electric Power (H)	21,120	2,110	18	1,232	0	24,480	2.6	21,244	-485	109,793	1,276
Atlantic Energy (H)	771	373	527	0	9	1,680	4.0	1,324	9	10,039	95
Baltimore Gas & Electric	3,492	1,850	719	0	3	6,064	10.6	1,154	0	961	-121
Bangor Hydro-Electric	111	0	0	33	21	166	-1.2	725	145	3,184	93
Boston Edison	1,797	669	296	0	0	2,762	0.0	362	0	12,476	18
Carolina Power & Light	5,102	2,635	1,018	218	0	8,973	-0.5	6,168	0	44,882	789
Centerior Energy (H)	4,384	1,858	135	312	4	6,693	1.3	0	0	23,735	269
Central Hudson Gas & Electric	911	98	48	44	5	1,106	0.4	608	6	7,583	53
Central Louisiana Electric	1,686	0	0	0	0	1,686	0.0	1,164	0	11,650	441
Central Maine Power	589	29	42	366	0	1,025	-9.2	2,240	10	19,206	406
Central Vermont Public Service	22	20	29	43	2	115	0.1	624	-0	7,704	172
Central & South West (H)	12,709	630	262	0	555	14,156	0.1	16,059	251	64,925	983
CILCORP (H)	1,106	0	30	0	0	1,136	0.0	331	0	8,032	17
Cincinnati Gas & Electric	4,183	0	475	0	0	4,659	14.9	1,699	-14	12,218	170
CIPSCO (H)	2,680	0	0	0	3	2,683	1.4	4,601	41	9,098	28
Citizens Utilities	INFORMATION NOT PROVIDED BY COMPANY										
CMS Energy (H)	4,043	847	474	1,023	0	6,387	1.9	9,859	-2	57,297	680
Commonwealth Edison	8,703	11,48[illegible]	1,310	0	22	22,522	0.0	5,083	65	64,140	1,565
Commonwealth Energy System (H)	1,026	41	48	0	17	1,132	4.2	361	0	9,675	79
Consolidated Edison	6,235	931	2,128	0	0	9,294	0.9	431	0	92,109	388
Delmarva Power & Light	1,818	321	483	0	23	2,645	5.7	1,399	-1	10,606	226
Detroit Edison	7,502	1,060	507	917	147	10,133	0.1	5,586	108	39,721	423
Dominion Resources (H)	6,058	3,171	1,214	1,592	0	12,035	-2.9	5,791	-129	55,542	950
DPL (H)	2,834	0	149	0	34	3,017	13.8	1,797	2	NA	NA
DQE (H)	2,106	662	66	0	0	2,834	NA	661	NA	11,213	NA
Duke Power	7,316	7,054	599	2,682	0	17,651	8.3	12,606	57	69,268	1,849
Eastern Utilities Associates (H)	512	80	0	0	63	655	-0.1	394	30	5,926	645
Empire District Electric	414	0	228	16	0	657	0.0	1,286	3	5,336	86
Entergy (H)	12,108	3,840	528	70	6	16,552	0.3	10,389	116	78,464	348
Florida Progress (H)	4,167	747	1,709	0	0	6,623	0.8	4,355	41	5,059	243
FPL Group (H)	8,532	2,885	2,344	0	14	13,775	1.1	5,567	18	53,498	720
General Public Utilities (H)	3,507	1,428	1,480	634	0	7,049	2.6	6,704	5	67,114	1,361
Green Mountain Power	12	0	52	36	7	107	-18.9	281	-0	2,651	29
Gulf States Utilities	5,572	655	0	0	0	6,227	-0.3	4,185*	10	21,828	211
Hawaiian Electric (H)	1,266	0	130	0	157	1,553	-0.1	1,491	18	6,386	127
Houston Industries (H)	11,403	770	1,410	0	0	13,583	0.0	3,560	-11	31,341	5,539
Idaho Power	1,007	0	50	1,772	5	2,834	0.5	4,650*	-18	22,859	355
IES Industries (H)	1,134	371	203	0	12	1,720	1.9	4,267	14	15,257	4,810
Illinois Power	3,340	807	138	0	0	4,285	0.0	2,810	2	19,405	74
Interstate Power	898	0	114	0	11	1,023	7.5	2,602	6	642	29
Iowa-Illinois Gas & Electric	907	385	128	3	0	1,423	0.0	963	26	5,934	-41
IPALCO Enterprises (H)	2,755	0	60	0	14	2,829	0.0	1,056	0	9,974	201
Kansas City Power & Light	2,143	533	414	0	0	3,090	1.4	1,683	12	15,190	172
Kansas Gas & Electric	1,906	534	0	0	3	2,443	0.1	2,263	1	10,237	129
KPL Gas Service	2,281	0	341	0	0	2,622	1.3	4,400	-2	14,080	81
KU Energy (H)	3,079	0	59	24	0	3,162	0.4	4,688	-1	15,491	-187
LG&E Energy (H)	2,569	0	108	0	0	2,677	-2.2	886	-6	5,977	179
Long Island Lighting	INFORMATION NOT PROVIDED BY COMPANY										
Madison Gas & Electric	421	92	115	0	0	628	-1.2	286	-33	1,975	91
MDU Resources Group, Inc.	353	0	60	0	0	413	-5.0	3,146	-4	4,577	-6
Midwest Resources (H)	1,878	0	625	0	0	2,503	0.4	3,634	-142	14,902	626
Minnesota Power	1,051	0	0	121	0	1,172	0.4	2,150*	0	4,548	-991
Montana Power	697	0	0	481	0	1,178	0.2	6,853	-219	13,082	49
Nevada Power	1,337	0	609	0	30	1,976	11.9	1,468	25	7,852	623
New England Electric (H)	2,462	254	0	1,164	55	3,935	-3.5	2,676	-2	26,527	778
New York State Electric & Gas	2,412	196	0	70	8	2,686	0.1	4,295	-303	34,813	1,783
Niagara Mohawk Power	3,646	1,059	164	708	0	5,577	-0.8	9,191	-68	118,673	1,267
NIPSCO Industries (H)	3,179	0	203	10	0	3,392	0.9	3,027	8	8,651	62
Northeast Utilities (H)	INFORMATION NOT PROVIDED BY COMPANY										
Northern States Power	3,883	1,542	1,152	262	0	6,839	0.1	6,928	-3	41,026	395
Northwestern Public Service	199	0	49	0	38	286	NA	1,280*	NA	1,910	NA
Ohio Edison	4,717	1,189	138	0	26	6,070	-1.4	5,556	30	29,235	342
Oklahoma Gas & Electric	5,545	0	111	0	0	5,655	-0.6	4,621	17	26,601	88
Orange & Rockland Utilities	871	0	91	44	0	1,006	0.1	551	0	6,339	290
Otter Tail Power	534	0	87	4	1	626	-0.9	5,280	6	NA	NA
Pacific Gas & Electric	7,213	2,160	418	3,724	1,291	14,806	NA	18,342	NA	102,733	NA
PacifiCorp	6,285	27	15	1,103	21	7,451	2.2	15,483	103	44,354	139
Pennsylvania Power & Light	5,800	1,905	486	146	22	8,359	0.4	1,308	0	62,955	1,097
Philadelphia Electric	2,769	3,936	756	1,290	13	8,766	0.0	953	0	30,595	102
Pinnacle West Capital (H)	2,153	1,109	754	4	0	4,020	-3.4	4,818*	21	18,545	275
Portland General (H)	325	745	650	611	6	2,337	-12.1	1,896	-87	14,489	-40
Potomac Electric Power	4,809	0	1,025	0	1	5,835	6.9	814	0	17,114	250
PSI Resources (H)	5,386	0	0	45	196	5,627	0.0	5,426	19	19,773	-1,505
Public Service Enterprise Group (H)	4,341	2,807	3,064	180	5	10,397	NA	1,097	NA	31,937	NA
Public Service of Colorado	2,681	0	209	365	16	3,271	0.2	2,645	19	19,134	57
Public Service of New Mexico	1,181	390	20	0	0	1,591	0.0	2,815	27	7,319	96
Puget Sound Power & Light	858	0	700	310	3	1,870	0.0	2,256*	8	16,061	557
Rochester Gas & Electric	541	622	29	47	0	1,239	0.1	707	1	11,247	187
San Diego Gas & Electric	1,611	517	332	0	0	2,460	NA	1,179	NA	15,737	NA
SCANA (H)	2,212	590	354	756	0	3,912	0.5	3,227	26	14,971	383
SCEcorp	8,769	2,541	1,614	1,154	8	14,086	0.0	11,676	74	101,927	293
Sierra Pacific Power	736	0	37	7	50	830	-0.7	3,642	20	11,876	573
Southern Company (H)	23,005	3,406	1,171	2,592	0	30,174	1.2	26,680	316	95,854	NA
Southern Indiana Gas & Electric	1,023	0	215	0	0	1,238	6.4	858	-6	4,082	33
Southwesten Public Service	3,945	0	102	0	14	4,061	0.2	5,701	158	NA	NA
St. Joseph Light & Power	278	0	103	0	0	381	0.0	533	0	2,355	11
TECO Energy (H)	3,050	0	188	0	37	3,275	2.6	1,206	39	8,916	75
Texas Utilities (H)	17,803	1,150	975	0	0	19,928	0.0	12,803	42	64,558	309
TNP Enterprises (H)	0	0	0	0	316	316	102.6	1,501*	0	9,085	NA
Tucson Electric Power	1,375	0	218	0	0	1,592	-5.8	1,967	70	12,078	465
Union Electric	5,351	1,125	374	681	5	7,536	0.0	3,190	0	39,234	4,424
United Illuminating	1,137	243	0	0	22	1,402	0.1	91	-6	4,242	37
UNITIL (H)	20	3	27	0	0	49	NA	101	NA	1,958	NA
Upper Peninsula Energy (H)	16	0	55	30	0	101	NA	780	NA	2,250	NA
UtiliCorp United	1,180	0	308	0	94	1,582	67.1	4,324*	2993	14,920	7,220
Washington Water Power (H)	459	0	68	940	0	1,467	0.0	2,166*	0	10,786	0
Wisconsin Energy (H)	INFORMATION NOT PROVIDED BY COMPANY										
Wisconsin Public Service	1,291	219	186	58	4	1,755	2.8	1,628	0	20,119	114
WPL Holdings (H)	1,454	213	174	21	1	1,862	-0.0	2,799*	6	10,462	118

(H) - Holding company
NA - Not Available/Not Applicable
0 (in change columns) - Less than 1% change and/or zero in both years
* Pole miles

POWER PRODUCTION UPDATE

HENRY STEIN, Senior Editor-Power Production

LCRA engineers new dam monitoring-and-control system

KANSAS CITY, MO—The Lower Colorado River Authority installed a programmable logic controller-based (PLC-based) system to monitor and control 13 remote hydroelectric units in central Texas from one main control room, said Fred Stearns, senior controls engineer for LCRA. The new system replaced hardwired controls at and between six dams on the Colorado River, he reported at the 1992 ISA/EPRI Joint Controls & Instrumentation Conference. The dams had been connected in pairs, with each downstream dam controlled by its upstream partner through hardwiring.

The project involved installing automated controls at all remotely located units (one dam to contain the central control station), refurbishing control panels, replacing electrical controls and wiring, upgrading existing instruments, installing additional critical instruments, and replacing switchgear at two plants. It was begun in early 1990 and finished in February of this year.

Personal computer (PC) operator interfaces and programmable controller control systems replaced the hardwired controls and remote terminal units (RTUs) at the dam units.

An RTU scheme was considered for automating the hydrogeneration units. However, many more RTUs would have had to be added to the existing ones, as would numerous relays. Because of the costs and complexities, LCRA ruled out the RTU option.

The utility decided to monitor every parameter the operator had had access to at the individual dams, which included such things as turbine guide bearing oil pressure that were only displayed at or near the point of measurement. The idea was to give an operator at the center enough information to properly monitor all units. The system also could be used for the operator to direct maintenance personnel to areas of potential problems.

Available documentation and plant personnel interviews provided the basis for a set of symbolic logics. The symbolic logics then were used to develop the PLC programs.

Using symbolic logic drawings forced the programs to be structured and consistent among units. Differences between units required only minor changes in the logic.

Manual bench boards at the units were left functional, which required that the PLC program be written to mimic the action of the bench board switches. To accommodate initial PLC checkout, and checkout after routine maintenance, each bench board function is available at a PC through the PLC program.

Alarm coordination

The database in the PC and the PLC program are coordinated, so an alarm condition is signalled to the PC when first noted. Then the operator can take early action before conditions get too far out of control.

If the operator takes no action within preset time limits, depending on the type of problem, and the monitored variable continues to go out of control, the PLC program shuts down the unit using normal shutdown procedure.

Then, if the monitored variable continues to go out of control faster than an orderly shutdown can be accomplished, and it is a variable that affects protective relays, the protective relays trip the unit.

The PLC program "mimics" the action already taken by the relays, so the control system "knows" what has transpired. If a PLC fails, the system sends a failure alarm to the central PC.

PLCs are set to fail with all outputs open, so the unit continues to operate and is protected by its protective relays until someone can be sent to the plant to take manual control or repair the PLC. Note that each plant now has double safety sytems—PLC and protective relays—whereas before it depended on protective relays alone.

Since Wirtz is the centrally located plant, it was chosen as the Master Control Station. Any of the units at any plant can be monitored and controlled from this station.

Wirtz has three 486-based operator interface computers, a 486-based file server for communications between operator and interfaces, and a 386-based computer acting as the communications front end for interfacing with remote plants.

Each operator interface monitor can display any one of several graphic screens that depict portions of the generation equipment. From the screens, the operator can determine plant status and initiate plant action.

LCRA technicians created all the graphic and alarm screens, and built all the databases that provide operator interfaces.

Communication with the remote units is now over LCRA's microwave system from the central control station at Wirtz Dam. The company's own microwave system had uptime better than 98 percent, which was more reliable than the local telephone lines.

Leased phone lines were considered but rejected because of the reliability factor. In addition, the large number of small, rural telephone companies in the service area meant going through three or four of them to reach remote sites from Wirtz. This decreased line reliabilities even further.

The microwave system consists of five channels—each channel is dedicated to the link between one remote plant and the Master Station.

Every plant has a Local Control Station consisting of a 386-based PC communicating with its PLC and operating man-machine interface software, which is similar to that of the Master Station. Thus each local station monitor can display that station's graphics and alarm screens.

A subset of the station's database also resides in the local PC, which can take over station operation with its PLC in case of communications loss with the Master Station. Also, a local mode can be activated by personnel when they are working at the remote station.

LCRA did not hire an architect/engineer for the project, but purchased PCs, PLCs, and interface hardware directly. Instrumentation was bought from local vendors. In-house engineers programmed the PLCs.

The utility felt this procedure resulted in significant cost savings, opportunities for staff development, and a core of in-house expertise. The learned expertise extended beyond the knowledge of monitoring-and-control hardware and software to an in-depth knowledge of the hydrogenerators themselves.

However, a systems integrator was hired to supply and connect the PLCs, operator control stations, and graphic control software.

Unfortunately, doing-it-yourself meant the man-machine-interface (MMI) package took longer to configure and implement than planned. Operator screens had to be reconfigured with less information than originally desired because they took too long to "build." And as of June, the company still did not have the envisioned reporting package working.

Startup

Startup of each station began with wire checking, then a functional checkout from the bench board, and finally PLC checkout and startup.

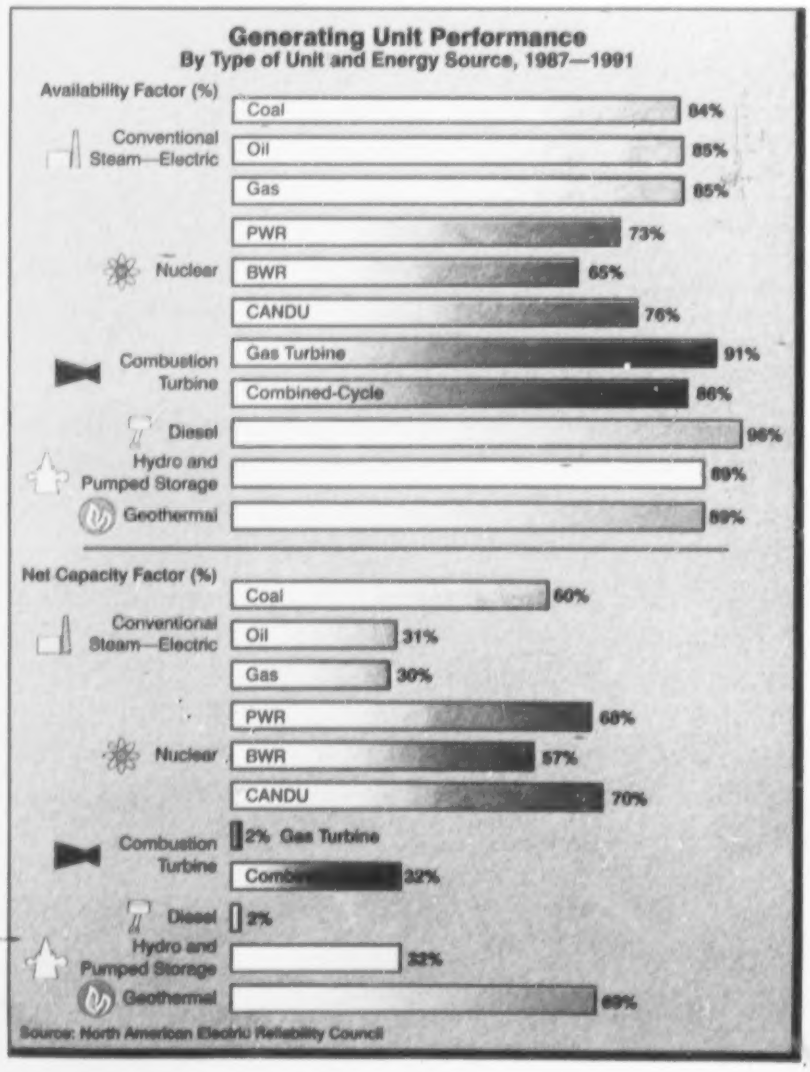
The first unit to be started up uncovered most of the problems with the new system. The major problem turned out to be operator actions.

Operators were used to making small adjustments as they ran units, but were not really aware of their actions. They had to learn to allow time for the system to move to sets of conditions, time for the program to recognize the changed conditions, and finally time for the program to make the necessary adjustments for the conditions.

All equipment, excluding a pumpback unit for pumped energy storage at one dam, was operational as of June 1991. At that time, LCRA had 12 operators assigned to Wirtz to control the 13 units. By November, only five operators were needed.

A side benefit of the new system was to increase the full-load generation from the two units at the Starcke Plant from 16.0 MW to 16.6 MW.

After some months of running with the new system, operators noticed that when the plant was running full-load, the excitation voltage was near the rated limit, but the current was lower than rated. The low-side taps on the generator step-up transformers were moved to reduce low-side voltage and increase current to gain the extra 0.6 MW.



Generating Unit Performance
By Type of Unit and Energy Source, 1987—1991

Source: North American Electric Reliability Council

Call for papers—coal utilization conference

WASHINGTON—The Coal & Slurry Technology Association is seeking papers for presentation at a conference it sponsors, to be held April 26-29, 1993, in Clearwater, FL.

The 18th International Technical Conference on Coal Utilization & Fuel Systems will present developments in coal preparation, benefication, liquefaction, transportation, desulfurization, and combustion. Papers dealing with economic, regulatory, and environmental considerations of these technologies are welcome.

Of particular interest, said the organizing committee, are papers relating to the federal government's Clean Coal Technology program, and papers about technologies for retrofitting or repowering coal-fired power plants.

Submit a 400-500-word abstract by Oct. 1, 1992, that summarizes the topic's objective and current status. Send it to: Coal Utilization & Fuel Systems, Conference Organizing Committee, 1156 15th St., NW, Suite 525, Washington, DC, 20005.

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ELECTRIC LIGHT & POWER

EL&P

OCTOBER 1992
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VOICE OF THE ELECTRIC UTILITY INDUSTRY

LATE NEWS

Energy legislation debate continued during September with efforts to exclude House bill transmission access provisions from the conference committee rewrite. A separate coalition, charging monopoly exploitation, favors tying access to holding-company reform. Separately, the administration and major industry associations oppose shifting hydro licensing authority away from FERC. The House named more than 100 conferees. Congress is targeted to adjourn Oct. 2.

Weather cools '92 summer peak demand

Mark T. Hoske, News Editor

BARRINGTON, IL—Utilities experienced fewer record electric peak demands this summer than in 1991 and showed a rare decline in overall peak load.

Mild weather in many regions seems to be the main reason for the drop, although demand-side management and a slow-growing economy may have contributed.

For the 56 utilities surveyed by *EL&P*, January-August peaks fell an average of 1.5 percent when compared to their peaks in 1991. In 1992 through August, the peak was 386,201 MW for the sample; during 1991 it was 392,110 MW.

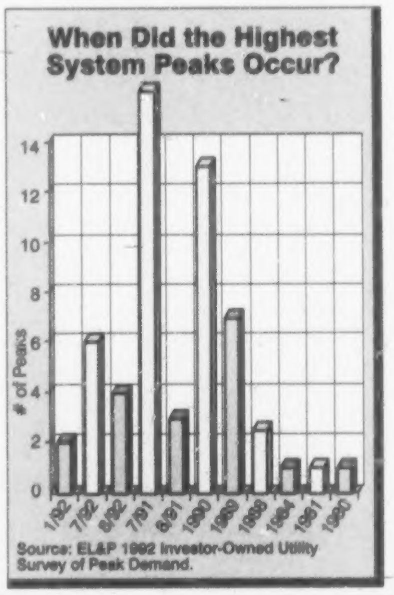
From 1980 to 1991, summer peak load declined only twice, in 1982 and 1989, according to North American Electric Reliability Council (NERC) and Edison Electric Institute (EEI).

NERC predicted a 2-percent gain

NERC's 1992 Summer Assessment predicted a 2-percent gain in U.S. peak demand this summer.

Only 10 utilities of the 56 in the sample set new all-time demand peaks during July and August. Nineteen peaks from July and August 1991 remained all-time records (see chart).

EL&P surveyed more than 50 of the largest (by megawatthour sales) investor-owned utilities by telephone Sept. 1-4. The *EL&P* sample represents about 70 percent of the total 1991 U.S. electric utility industry in peak load throughout all regions (excluding Alaska and Hawaii).


When Did the Highest System Peaks Occur?

Source: EL&P 1992 Investor-Owned Utility Survey of Peak Demand.

Results show Florida Progress Corp. gained the most in peak demand from 1991 to 1992, more than 15 percent, setting a new all-time peak. (See table of system peaks for the full list.)

Fewer records may depress sales

Setting a new peak demand record doesn't necessarily mean the rest of the season will include strong energy sales, but it can be an indicator for some utilities.

Midwest Resources' John McCarrol said weather recently depressed that utility's peaks, megawatthour sales, and bottom line.

"Because of the weather, our second quarter was bad. Now we think our third quarter will be too," McCarrol said, due to continued cool Midwest summer temperatures. "Maybe next year," he added.

Utilities configure their electrical systems to handle anticipated peak demand by adding facilities and/or buying additional power. Influences to peak demand include weather, energy efficiency, customer mix, number of customers, economic growth, air conditioning electric heating, and natural gas use.

Utilities attention to demand-side and load management also may have reduced the peaks. *EL&P*'s January report on capital spending at electric utilities shows more capital spending in these areas from 1992 to 1995.

Other peak-related news

Other peak-related information follows.

- Tennessee Valley Authority's summer peak was 21,980 MW on July 13, less than the 1991 peak of 22,081 MW on July 22. TVA set an all-time peak of 24,627 MW in December 1989.

When compared to the largest leading investor-owned utilities, this Knoxville, TN-based federal utility was second only to Southern Co. in all-time peak record.

- New England Power Pool, covering six states, showed a 0.3-percent increase in kilowatthour use in 1992 over 1991 through July. Despite the slight gain in amount of electricity used in 1992, NEPOOL's 1991 demand peak still stands, 19,742 MW on July 19.
- New York City, from January to mid-August, had only seven days with temperatures at or above 90°F, compared with an average of 17, according to Pennsylvania State University.
- An air conditioning manufacturing company announced layoffs and plant closings because of low product demand. Sales of seasonal equipment,

Continued on page 2

Presidential candidates' energy views outlined

President George Bush says he's committed to energy issues and the environment and that his record shows it.

Gov. Bill Clinton, the Arkansas democratic challenger, says the administration has done little or nothing in these areas, and that he'd make the U.S. a leader in environmental progress.

The Bush/Quayle ticket:

- Introduced the National Energy Strategy in February 1991. Congress was still working on an energy bill as of mid-September. The NES includes incentives for domestic oil and gas production, promotes energy efficiency, clean coal, and nuclear power. It relies on competition, rather than command-and-control measures, removes regulatory barriers, and invests in research.
- Has at least a dozen initiatives on oil and natural gas, aiming to increase competition and use of natural gas, and decrease oil imports.
- Seeks nuclear energy and coal policies to streamline nuclear licensing, support advanced nuclear reactors (see story this issue), ensure progress on nuclear waste disposal, and demonstrate and export clean coal technologies. Settled questions about power plant modifications and emissions standards with the "WEPCo" rule.
- Encourages renewable energy sources, hydropower, and alternate-fueled vehicles with more than nine specific policy initiatives.
- Promotes energy and economic proficiency in more than eight ways, including requests for added funding, voluntary programs. Signed new laws for greater energy efficiency in new public housing and more mass transit.
- Proposed and signed Clean Air Act Amendments into law.
- Rejects carbon taxes and mandates for CO_2 reductions, instead promoting voluntary programs to limit suspected greenhouse gases. Ac-

d CFC cuts.

on/Gore

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had a national energy policy.

- Would promote national security, energy diversity, economic prosperity and environmental protection by increasing energy efficiency, conservation, natural gas use, renewable energy resources, and opposing increased reliance on nuclear power.
- Promotes utility regulatory changes to make energy efficiency profitable for utilities and customers.
- Strengthens federal programs to improve energy efficient housing and encourage state and local governments to stiffen related building codes. They would also increase vehicle fuel standards by as much as 64 percent to 45 mpg. Standards would insure that federal grants, contracts and projects support national conservation goals.
- Would increase use of natural gas in all sectors, speed development of new pipelines, switch the federal fleet to natural gas and spend federal money to develop new natural gas applications.
- Hope to give utilities least-cost planning incentives, create a civilian renewable R&D agency, create renewable tax incentives, and shift national labs from defense R&D to more commercial renewable energy projects.
- Would prohibit drilling in Alaska's Arctic National Wildlife Refuge.
- Would unilaterally cap U.S. CO_2 emissions at 1990 levels by 2000 and encourage others to do so. Promotes accelerated CFC cuts.

Clinton created a state Department of Energy to emphasize renewable resources and reduce barriers to conservation. Arkansas ranks 10th in state energy research spending.

Sen. Albert Gore's (D-TN) congressional work includes four amendments to the 1992 energy bill. One would accelerate government efforts to procure the most energy efficient products and provide energy efficiency grant money to states.

Gore also wrote *Earth in the Balance*. The book calls for a global Marshall Plan of dramatic environmental actions to avoid numerous worldwide disasters that he says will occur if we don't change course.

The Clinton campaign said its views on energy and environment were formed before bringing in Gore, but that some areas were "updated somewhat" based on Gore's views. Even though the book may not become policy, be sure to read it for a full view of the Gore half of that ticket.

—Mark T. Hoske, News Editor

from page 1

Peak demand...

such as pools, are also reported to be down in many regions.

Two major weather disturbances may have contributed to unusual 1992 weather.

In June 1991 the Philippines' Mt. Pinatubo errupted. The resulting airborn debris is spreading throughout the upper atmosphere, reflecting more solar energy, and shifting some global weather patterns. "El Nino," an unrelated 2-10-year cycle of warm Pacific currents, also has had an effect, according to meteorologist Jim Duthie at WeatherBank, based in Salt Lake City.

As a result, many Midwest utilities' second-quarter reports read like a fall evening weather report, telling of "mild temperatures," and "cool weather in our service area." All regions show a drop in electric output, except for Rocky Mountain, Pacific Southwest, and Southeast areas, according to EEI. Gains in three regions, EEI said, contributed to a low overall increase of just 0.2 percent in electric output.

The U.S. Department of Energy confirmed that demand is steady "mainly because of milder first-quarter temperatures."

EL&P staff contributed to this report.

What Year Did the Highest System Peak Occur ?

Investor-Owned Utility	Peak Demand (MW), Date		% Change, '91-'92	1991	Date	Pre-1991	
	Jan.-Aug. 1992						
	All-Time Peaks in 1992						
Carolina Power & Light	9235	July 14	3.1	8960	July 23		
Duke Power	14763	July 14	0.6	14677	July 23		
Florida Progress Corp.	6982	Jan. 17	15.3	6056	Feb. 16		
FPL Group	14661	July 9	3.8	14123	Aug. 12		
Pinnacle West Capital Corp.	3771	Aug. 17	6.8	3532	Aug. 9		
San Diego Gas & Electric	3335	Aug. 17	8.7	3069	Oct. 10		
SCANA Corp.	3380	July 13	2.4	3300	July 23		
SCEcorp	18413	Aug. 17	10.2	16709	Oct. 2		
Dominion Resources	12942	July 14	0.02	12939	July 23		
Allegheny Power System	6530	Jan. 16	4.7	6238	Dec. 19		
Central & South West	10627	Aug. 10	4.2	10203	Aug. 1		
TECO Energy	2989	July 9	5.7	2829	Aug. 12		
				All-Time Peaks in 1991			
American Electric Power Corp.	20175	Aug. 10	-9.8	22360	July 22		
Baltimore Gas & Electric	5558	July 14	-6.0	5910	July 23		
Boston Edison	2543	Aug. 26	-4.1	2652	July 23		
Cincinnati Gas & Electric	4101	N.A.	-1.4	4161	July 22		
CMS Energy	5932	Aug. 10	-2.5	6084	Aug. 29		
Commonwealth Edison Co.	15994	Aug. 10	-9.8	17733	July 22		
Consolidated Edison	9905	Aug. 14	-7.9	10752	July 23		
Delmarva Power & Light	2398	July 14	-1.3	2430	July 23		
DPL	2559	Aug. 10	-6.3	2730	July 22		
General Public Utilities	8067	July 14	-2.5	8271	July 23		
IPALCO Enterprises	2505	Aug. 10	-3.0	2583	July 22		
Kansas City Power & Light	2624	Aug. 10	-4.6	2751	July 22		
Long Island Lighting Co.	3611	July 14	-7.5	3904	July 23		
New England Electric System	3660	July 21	-13.9	4250	July 19		
Northern States Power	6100+	July 12	-13.8	7080	July 16		
Ohio Edison	5247	Aug. 10	-4.8	5513	Aug. 29		
Potomac Electric Power	5546	July 14	-3.9	5769	July 23		
PSI Energy	4827	Aug. 10	-1.6	4907	July 22		
Wisconsin Energy	4640	Aug. 25	-3.3	4797	Aug. 27		
						Pre-'91 All-Time Peaks	
Centerior Energy	3599	Aug. 10	-7.1	3874	Aug. 29	4067	Aug. 1988
Detroit Edison	8703	Aug. 10	-3.1	8980	Aug. 29	9133	Aug. 2, 1988
DQE	2308	July 14	-3.9	2402	July 23	2522	July, 1981
Entergy	11963	July 8	0.9	11852	July 12	12189	Aug. 29, 1990
Gulf States	5247	July 7	0.4	5224	N.A.	5604	Aug. 22,1980
Houston Industries	11649	July 30	0.4	11601	Aug. 21	12216	Sept. 1990
Idaho Power	2244	June 11	5.6	2125	July 3	2327	Feb. 1989
Illinois Power Co.	3358	July 13	-5.1	3537	July 22	3775	Aug. 16, 1988
KU Energy	2845	July 13	-1.2	2894	July 23	2919	Dec. 22, 1989
LG&E Energy	2107	July 13	-0.8	2125	July 22	2149	July 10, 1990
Midwest Resources*	1208	July 8	-11.0	1358	July 22	1390	Aug. 27, 1990
New York State Electric & Gas	2524	Jan. 16	2.1	2471	Jan. 22	2597	Dec. 21, 1989
Niagara Mohawk Power	6159	Jan. 16	1.9	6045	Dec. 17	6326	Dec. 21, 1989
NIPSCo Industries	2718	Aug. 10	0.8	2696	July 22	2739	Sept. 6, 1990
Oklahoma Gas & Electric	4550	Aug. 10	-3.0	4690	Aug. 7	4890	Aug. 29, 1984
PacifiCorp	7042	June 23	-4.0	7338	Jan. 29	7735	Dec. 20, 1990
Pennsylvania Power & Light	5876	Jan. 16	4.4	5627	Dec. 19	5884	Dec. 22, 1989
Portland General Electric	2906	Jan. 7	7.3	3136	Jan. 4	3698	Dec. 20, 1990
Puget Sound Power & Light	3837	Jan. 7	-5.8	4073	Jan. 29	4615	Dec. 21, 1990
Southern Company	23970	July 9	-5.1	25261	July 23	25981	Aug. 29, 1990
Southwestern Public Service	3205	Aug. 10	2.8	3118	July 10	3217	June 26, 1990
Texas Utilities	17525	Aug. 10	3.4	16952	Aug. 8	18007	Aug. 30, 1990
Union Electric	7135	July 13	-3.1	7367	July 22	7465	July 9, 1990
Washington Water Power	1309	Jan. 22	-11.1	1472	Jan. 29	1660	Feb. 2, 1989
PacifiCorp	18594	Aug. 11	-0.1	18620	July 2	19400	Aug. 9, 1990

*Only for Iowa Power. Combined numbers with IPS, unavailable. +Estimate

Source: EL&P 1992 Investor-Owned Utility Survey of Peak Demand

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1st Phase 1 unit complies by buying scrubber services

GARY, IN—Northern Indiana Public Service Co. dedicated someone else's scrubber in late August. As a result, two 1960's vintage units at NIPSCo's Bailly station are the first Phase 1 units to comply with the Clean Air Act Amendments of 1990.

NIPSCo doesn't own the new, $150-million emissions control equipment at Bailly, but buys sulfur-removal services, the first such U.S. arrangement for scrubber operation.

The scrubber started operating in June, 2.5 years ahead of the 1995 Phase 1 deadline, because it was partially funded by the U.S. Dept. of Energy through the second round of the Clean Coal Technology program.

Pure Air, a partnership of Mitsubishi Heavy Industries and Air Products and Chemicals, owns and operates Bailly's scrubber. NIPSCo agreed to pay Pure Air approximately $20 million per year for 20 years—equivalent to about $400 per ton of SO_2 removed at current operating levels and coal sulfur levels.

(The range of two publicly announced SO_2 allowance trades was $250-400, *EL&P*, 6/92, p.1).

NIPSCo and Pure Air still have to negotiate how excess allowances will be treated; the contract was signed before CAAA was passed.

Robert Conley, president of Allentown, PA-based Pure Air, said in previous comments that "the value of the allowances is a big part of using flue-gas desulfurization systems."

The scrubber on the two Bailly units, totalling 528 MW, reduces SO_2 emissions by 50,000 tons per year. The plant will comply at 85 percent SO_2 removal, said Conley, but the contract calls for 90-percent removal, so "it definitely will generate allowances," he said. The plant can run at removal rates of 95 percent or more.

Pure Air proposals to other utilities include partial payment in excess allowances as an option, Conley noted.

The Mitsubishi scrubber design is also the first in the U.S. to rely on a single absorber module. It has other innovative design features, including the production of high-purity calcium sulfate which is used for wallboard manufacture. U.S. Gyspum Co. has a 20-year contract with NIPSCo to buy a minimum of 140,000 tons per year of the synthetic gypsum.

It is also the largest scrubber for high-sulfur coal. Bailly uses local coal.

All 11 NIPSCo coal-fired units now comply with Phase 1, without an immediate rate increase, noted chairman and CEO Edmund Schroer. "A modest rate increase may occur in 1996, at the earliest...less than 5 percent," he said.

NIPSCo relies on sulfur-dioxide removal from the Pure Air scrubber at Bailly station.

Sales incentives attract greater interest from electric utilities

Thomas R. Mott-
Sandra R. Miller
Hewitt Associates
Lincolnshire, IL

Competitive industries have long embraced sales incentive compensation as "fuel" for the personal selling engine that contributes so much to their success.

Company after company has adopted, modified, and enhanced innovative sales compensation and recognition techniques. What do these organizations have in common? Each uses financial rewards to communicate their priorities and influence sales force behaviors accordingly—and to drive time, effort, and initiative toward achievements that are important to their mission.

What about utilities? Until recently, there has not been much to report in the area of sales incentive compensation. Many gas utilities have well-developed sales incentive compensation programs for commercial, industrial, and residential salespersons. And, utilities selling appliances have typically adopted the prevalent commission models found in "big-ticket" retail selling.

The norm, though, is mostly salary, mostly security-oriented, and definitely outside the "motivation" arena. Sales compensation has not become a common term in the utility industry.

In the past, the customer service personality of utilities made sales incentives inappropriate. This is no different than in competitive industry, where customer service personnel tend not to participate in incentives in a substantial way. The customer service world is not cash-incentive rich.

In contrast, the typical sales employee working for a major non-utility corporation will have incentive opportunities as well as a salary.

It is not unusual for salespeople to have 20 percent to 40 percent (or more) of their targeted cash compensation at

Continued on page 8

Illinois Power halts mandated scrubber

DECATUR, IL—Illinois Power Co., because of legal and regulatory uncertainties, suspended a work on a $300-million scrubber at its Baldwin station. The move followed a state regulatory decision to deny cost recovery on some Clinton nuclear expenses and lower rates by $21.5 million.

To meet Phase 1, IP is looking toward medium-sulfur Illinois coal. Phase 2 would require scrubbers to continue with Illinois coal.

Illinois Power's Craig Nesbit said a 1991 state law tries to mandate use of Illinois coal with scrubbers at Baldwin, but doesn't say when. Vagueness in the law, questions about limits to interstate commerce, and least-cost planning mandates may bring a later challenge to the state law, Nesbit suggested.

Work continues on massive multi-state Andrew recovery

Hurricane Andrew may require the most extensive cleanup ever for U.S. electric utilities. Some service won't be restored for as long as ~~44 days,~~ and utilities will be working for months making permanent repairs to temporary patches in the systems.

Andrew, a four on a five-scale level of severity hit Florida on Aug. 24 with sustained winds of 140 mph and gusts up to 165 mph, according to Accu-Weather Inc., based in State College, PA. Louisiana sustained an initial impact of 120-mph winds and gusts to 140 mph on Aug. 26, Accu-Weather said.

Florida officials estimated Andrew's damage could total $20 billion just in that state. In comparison, Hurricane Hugo, in 1989, caused $10 billion in total damages.

Florida Power & Light, the heaviest hit utility, had 1.4-million customers out at the peak, with damage concentrated in south of Miami.

Seventeen days after hurricane Andrew hit FPL, 84,000 customers were still without power; full restoration may take until Oct. 7 to all areas able to receive power.

The Homestead, FL, municipal utility was virtually wiped out, along with a majority of the buildings in the city of 20,000 residents, according to the American Public Power Association.

In Louisiana, about 322,000 customers lost electric service.

In related news, energy futures contracts jumped with speculation of oil and natural gas shortages from hurricane destruction to area production facilities. Industry sources reported limited damages with no long-term effect on price or availability.

No estimates were available on the cost damages to FPL facilities. On Sept. 9, FPL spokesperson Stacey Shaw said "so much area has not been completely surveyed, it's still premature to be asking."

Bob Marshall, FPL vice president for power distribution, said FPL used multiple decentralized command centers to put resources closer to the need. About 3500 office workers were previously trained as damage scouts to help repair crews. Supplies were stockpiled and prepackaged in sets. Experience from hurricanes Hugo and Gilbert helped, Marshall added.

Despite preparations, some scenes were surprising.

FPL's Bill Swank said, on Aug. 25, the day after Andrew hit, "Entire neighborhoods are gone with just concrete pads remaining. You can't imagine the amount of damage. Huge concrete transmission structures were snapped off like sticks."

Swank added, "This was the worst hurricane to hit a major metropolitan area this century in terms of damage."

FPL had as many as 987 line and 418 tree crews at work, 746 of its own and the others from five nearby utilities. A total of 3300 utility workers helped, from Florida, Alabama, Georgia, and South Carolina. Thefts of downed lines and new supplies hampered efforts.

The destruction wasn't all to the power delivery system. Andrew came ashore near FPL's Turkey Point facilities. The two nuclear units were undamaged, but all connecting transmission was "ripped out." Two natural gas/oil units sustained "major structural damage" to the stacks, turbine deck, water tanks, and supporting buildings. A fuel oil tank was destroyed, but no oil leaked into the bay. The gas-fired Culter plant was also damaged. Full assessments were unavailable by Sept. 10.

Utilities send help

TECO Energy, adjacent to FP&L, sent equipment and 85 people to help the recovery effort. One spokesperson at TECO's Tampa Electric said, "There's intensive devastation down there. It looks like a bomb went off." South Carolina Electric & Gas sent 120 employees to help FP&L.

In Louisiana, Gulf States Utilities' Susan Gilly said that utility lost 160,000 customers at the peak; all were back the following week. No cost estimates were yet available for "extensive distribution and transmission line damage."

Morgan City, LA, municipal utility estimated that cost for permanent repairs to its 6000-customer system could exceed $2.5 million, according to Larry Bergeron, city administrator. Nearly all were restored by Sept. 9. The Morgan City plant, with 70 MW of natural gas turbines, sustained about $800,000 in building and cooling tower damage.

South Louisiana Electric Cooperative Association lost all 15,500 customers in five parishes, according to Rickie Pitri, manager of member services. Help came from as far as Alabama and Texas, all residential service was restored by Sept. 5; some remote service remained out as of Sept. 9.

Central Louisiana Electric Co., Entergy's Louisiana Power & Light and New Orleans Public Service, and Teche Electric Cooperative, based in Jeanerette, LA, also had damage.

Clean air: acid rain rule due, regulators examine compliance

WASHINGTON—After missing deadlines for releasing Clean Air Act Amendment regulations, the Environmental Protection Agency made a new schedule. EPA expects to release a final rule on acid rain this month.

Utilities and state regulators continue work to meet compliance deadlines, which remain unchanged.

Some of the utilities hardest hit for SO_2 removal are Tennessee Valley Authority, Georgia Power, PSI Energy, and Ohio Power, according to Research Data International, based in Boulder, CO. Total SO_2 compliance cost for these four will be nearly $1.2 billion, RDI said (see table).

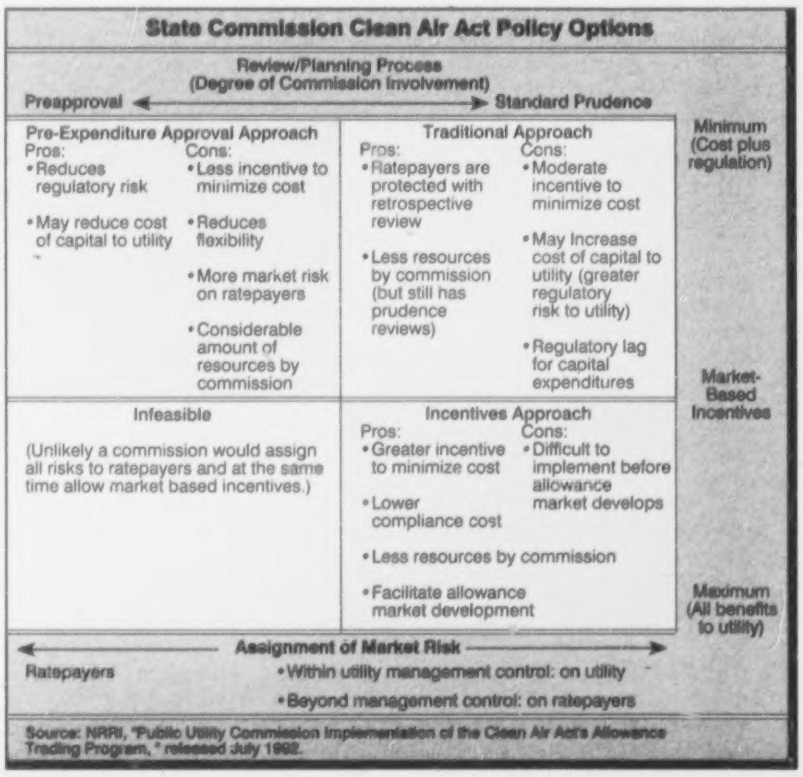
The EPA boasts about 100 CAAA regulatory actions since President Bush signed the law in November 1991. EPA hopes to update its schedule and strategy annually.

Review in other administration departments has contributed to EPA's regulatory delays. EPA's Dave Ryan said NOx control regulations have been at the administration's Office of Management and Budget since April 15. An OMB spokesperson said on Sept. 10 that the NOx regulations were still under review and would not say when OMB would return them to EPA.

Delays affect utilities' ability to make compliance plans, and impairs state regulators' from establishing criteria to evaluate the plans.

A report released in mid-July by The National Regulatory Research Institute, Columbus, OH, says the most complex task state regulators face relates to making rules and procedures for compliance ratemaking and SO_2 allowances (see flow chart).

The report explains portions of CAAA, the roles of state and federal regulators, and related policy issues. It's called "Public Utility Commission Implementation of the Clean Air Act's Allowance Trading Program."



State Commission Clean Air Act Policy Options

Review/Planning Process
(Degree of Commission Involvement)
Preapproval ⟷ Standard Prudence

Pre-Expenditure Approval Approach	Traditional Approach	Minimum (Cost plus regulation)
Pros: • Reduces regulatory risk • May reduce cost of capital to utility Cons: • Less incentive to minimize cost • Reduces flexibility • More market risk on ratepayers • Considerable amount of resources by commission	Pros: • Ratepayers are protected with retrospective review • Less resources by commission (but still has prudence reviews) Cons: • Moderate incentive to minimize cost • May increase cost of capital to utility (greater regulatory risk to utility) • Regulatory lag for capital expenditures	Market-Based Incentives
Infeasible (Unlikely a commission would assign all risks to ratepayers and at the same time allow market based incentives.)	**Incentives Approach** Pros: • Greater incentive to minimize cost • Lower compliance cost Cons: • Difficult to implement before allowance market develops • Less resources by commission • Facilitate allowance market development	Maximum (All benefits to utility)

⟵ Assignment of Market Risk ⟶
Ratepayers
• Within utility management control: on utility
• Beyond management control: on ratepayers

Source: NRRI, "Public Utility Commission Implementation of the Clean Air Act's Allowance Trading Program," released July 1992.

20 Hard-Hit Utilities in Clean Air Act SO_2 Removal
Based on Present Compliance Plan

	Phase 1				Phase 2			
Utility System	Total Cost Millions $	Reduction 000s TSO_2	Cost $/$TSO_2$	Cost ¢/kWh	Total Cost Millions $	Reduction 000s TSO_2	Cost $/$TSO_2$	Cost ¢/kWh
Tennessee Valley Authority	43	264	163	0.06	261	877	298	0.29
Georgia Power (SC)	76	135	563	0.11	250	668	374	0.31
PSI Energy Inc.	75	195	385	0.26	199	499	399	0.63
Ohio Power (AEP)	95	604	157	0.24	193	728	265	0.46
Pennsylvania Power & Light	30	97	309	0.09	137	390	351	0.42
Ohio Valley Electric Corp.	76	304	250	0.43	125	428	292	0.69
Union Electric	71	186	382	0.25	121	382	317	0.38
Alabama Power (SC)	22	28	786	0.06	112	148	757	0.25
Virginia Electric & Power	18	47	383	0.06	110	216	509	0.31
Duke Power	NA	NA	NA	NA	101	158	639	0.22
Ohio Edison	23	98	235	0.10	94	234	402	0.37
West Penn Power (APS)	40	112	357	0.19	86	233	365	0.38
Illinois Power	41	101	406	0.29	81	261	310	0.50
Potomac Electric Power	10	50	200	0.06	78	166	470	0.36
Cleveland Electric Illuminating	37	103	359	0.23	77	231	333	0.45
Appalachian Power (AEP)	25	†	†	0.07	73	153	477	0.19
Niagara Mohawk Power Corp.	11	23	478	0.12	73	102	716	0.76
Indianapolis Power & Light	20	50	400	0.14	70	80	875	0.43
New York State Electric & Gas	6	20	300	0.04	62	124	500	0.34
Tampa Electric	37	68	544	0.21	56	150	365	0.29

NA — Not affected in Phase 1 TSO_2 — Tons of SO_2
† — Accrued costs are related to the purchase of SO_2 allowances.

Source: "Bulk Power Markets in the U.S.," Resource Data International, Inc. March 1992.

Australian utility tests arcing fault detector

MELBOURNE, AUSTRALIA—An intelligent device for detecting arcing faults in power lines has been successfully tested by the State Electricity Commission of Victoria (Australia). The device, which was developed at the Royal Melbourne Institute of Technology (RMIT), proved capable of detecting arcing faults very accurately and selectively.

The leader of the RMIT research team, Majid Al-Dabbagh, said that if this device were to be installed on power line feeder stations, a great improvement would be achieved in detecting and isolating faults.

The device interrupts the circuit immediately upon detection of arcing. It uses a pattern recognition technique to detect faults.

Al-Dabbagh has been working on this research for five years in collaboration with SEC Victoria and assisted by a grant from the Australian Electrical Supply Industry Research Board. SEC Victoria has installed a prototype in a substation for further assessment.

from page 2

Sales incentives...

risk, dependent on their achieving sales goals of one kind or another. And, exceptional sales producers generally enjoy the opportunity to earn significantly more (double would not be uncommon) through excellent sales performance, however that is defined by the employer.

In a "typical" non-utility competitive company we might find a salesperson in one territory in a particular year earning twice what his or her "neighbor" makes in the same company. Ideally, such earnings differences are justified by the revenue or other sales-oriented contributions of these sales employees, often related to quotas or other goals.

Why Utilities Would Adopt Cash Sales Incentives

Reasons to Implement	Percent of Human Resource Responses	Percent of Sales/ Marketing Responses	Percent of Total Responses
Support Strategy/Provide Direction	37 %	16%	25%
Increase Revenues/Profits	23%	26%	25%
Enhance Motivation	18%	29%	25%
Meet Competitive Pressures	14%	3%	8%
Top Management Desire	9%	0%	4%
Increase Sales Productivity	0%	19%	11%
Recognize Importance/ Contribution of Sales	0%	6%	4%

Source: Hewitt Associates Survey

Nearly 100 marketing and human resources professionals (from 57 utilities), mostly at management and executive levels, visited Indianapolis last year for a day-and-a-half workshop on sales incentive compensation (for utilities) that was hosted by Indianapolis Power & Light Co. They came from small utilities, rural utilities, mega-utilities, urban utilities, private and investor-owned utilities to consider if, and how sales incentive compensation can work for them.

Many of these utilities are thinking competitively—using terms like "market-driven," "customer-solution oriented," and "sales productivity." Sales incentive compensation is popping into their consciousness, if not yet into their employee handbooks.

Electric utilities are discovering how incentives can help meet strategic goals in demand-side management.

Comparative practices

To get a quick read on comparative practices in utilities, a brief survey was administered to workshop participants, and 43 utilities that identified themselves as electric (or "primarily electric") responded. Of these, only 11 (26 percent) claimed to "have a cash incentive (bonus or commission) program for non-supervisory sales/marketing personnel," and six of the 11 have had such plans for two years or less. Few electric utilities have a history of experience under such pay arrangements.

Excluding one that is now converting from a "holdover" plan dating to the days when its salespeople sold appliances, the average sales incentives of the other 10 responding utilities were just 8 percent of salary. Half (five) paid average sales incentives of 5 percent of salary or less. Such modest levels of incentives, in a sales compensation context, border on being "communication plans" or "reminder plans" rather than plans that really drive the behavior of covered employees.

It is significant that the electric utilities paying these small incentives have not modified the process or policies by which salaries are administered for the covered sales employees. So, unlike their non-utility counterparts, these utility salespeople would probably not perceive that a portion of their planned or "target" total cash compensation is contingent on meeting sales goals.

Why explore?

Why are utilities exploring incentive compensation?

- Some utilities, particularly those with $200+ million in revenues, have separated customer service and sales functions in their organizations. This increases the utility's ability (and need) to attract and retain the kinds of salespeople that relish competition and want to play the sales game with "real money" on the table.
- The sales and marketing function in many utilities is now being held accountable for some specific marketing goals. Goals remain the building blocks of any incentive compensation effort. When goals flow down from strategies, the stage is set for the question—"Now that we have defined what we need to accomplish, how can we increase the likelihood of it happening?" Incentive pay is often part of the answer.
- Utility diversification into unregulated areas brings management face-to-face with sales incentives in these sectors, perhaps for the first time.
- Electric utility executives are becoming increasingly more affected, personally, by incentive pay practices. Surveys show a trend toward more, and larger executive incentives in electric utilities over recent years. The executive whose pay is contingent on results often seeks ways to stimulate the same kind of "eco-

Continued on page 11

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Inquire R.S. 3

from page 8

Sales incentives...

nomic urgency" among those in the company who can really move the needle on the company's speedometer.

- All industries share frustration at the inability to recognize and reward superior performance through meaningful merit increases. Minuscule budgets have taken their toll on salary-based pay-for-performance efforts, and this has sent compensation professionals looking for avenues to implement other reward systems—wherever the possibility exists. We have heard the comment, "maybe we can *at least* get some kind of pay for performance going in the sales area, where results are more measurable."

Customer persuasion

Demand-side management (DSM) programs provide the kind of "customer persuasion" opportunities that have been in short supply for many electric utility salespersons.

Our counterparts in other industries might find it confusing, or at least amusing, to provide incentives to salespeople for influencing customers to use less product, or to use it more extensively when its price (rate) is lower. Nevertheless, the selling principles in DSM are much the same as in sales compensation programs that reward demand creation:

- Identify the potential sales opportunity with a particular customer and listen to the customer to define the perceived need.
- Build the logical case for your program to satisfy the need and present the case to the customer.
- Overcome customer objections and close the sale.
- Get the reward for your effort—but, be psychologically prepared for a "no thanks" (and no reward!).

The sales process described above, applied to DSM program selling, lends itself nicely to incentive compensation.

In the Indianapolis conference, both Wisconsin Electric Power Co. and Northern States Power Co. presented their experiences with programs that reward employees for DSM results achieved through sales effort. These were cash programs, funded by formulas and driven by goals. Team and individual components were present.

At the conference and in ensuing months we have noted that a number of other electric utilities have, or are developing programs of their own. Experimentation? It seems more than that.

Barriers remain

Will sales incentive compensation become the norm, rather than the exception, among electric utilities in the near future? The trend toward sales incentives may continue. Certain barriers remain, however.

- Two-thirds of the survey respondents at the Indianapolis conference said that "choosing performance measures" would represent a major challenge in implementing a sales incentive program.
- Nearly half of the Marketing/Sales people responding to the survey said that clarifying job roles and accountabilities would be a necessary and challenging step before introducing incentives.
- Nearly half of the Human Resources respondents said they felt that the systems to track results in the utility sales environment would be problematic.
- About 50 percent of attendees expressed reservations about "program design." Perhaps they have trouble visualizing a sales incentive program at their utility; and, maybe they have never tackled an incentive design project.

Electric utilities will probably become more comfortable with incentive compensation for salespeople as the number of programs increases in the industry. For now, most lessons in sales incentives may need to be borrowed from other industries where similar issues exist—such as telecommunications (with its regulatory heritage), banks (with cultures that have been more security oriented), and any industry where the sales process involves extensive technical support.

Open-ended question

An open-ended question at the close of the survey, for those utilities without sales incentive programs, asked: "What do you believe is the most compelling reason to implement cash sales incentives at your utility?" We summarized 53 narrative responses as shown in the table.

The answer patterns were a bit different between the human resources and the marketing/sales respondents.

Three themes emerged, in equal strength, as the primary reasons to initiate cash sales incentives at a utility:

- To support the strategic direction of the enterprise and provide an appropriate focus for sales and marketing efforts.
- To contribute to desired increases in revenue and profits.
- To enhance motivation of sales personnel.

When and if utilities embrace the concept of sales incentive compensation more fully, this data suggests they will do so for the same reasons as companies in other industries where competition has been the accepted order.

When an organization decides sales incentive compensation might be timely—then what? The wrong approach is to jump in and "try something" with the notion that it can be fine tuned later based on experience. Just as a well-designed program gets results, a poorly-designed sales incentive compensation plan can have devastating effects on employee morale and employees will not soon forget the bad experience.

Electric utilities that look carefully at feasibility first before "leaping," and those that follow a thoughtful installation process, can benefit from the sales compensation experiences in the many industries that have blazed the sales compensation trail ahead of them.

David Marder, president of Hewitt Associates' Utilities Consulting Group, McLean, VA, also contributed to this story.

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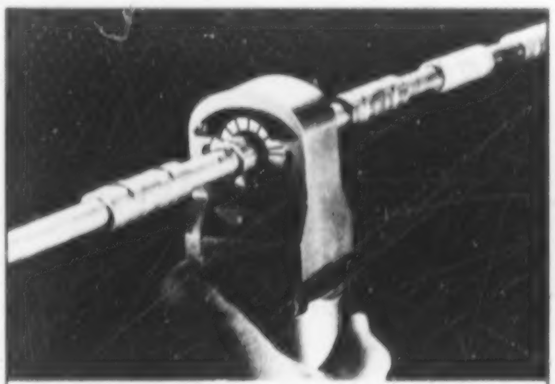

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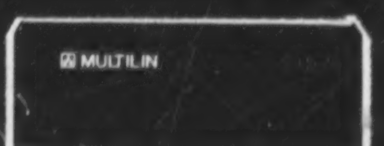

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Inquire R.S. 6

Forced outages are worst in first week after planned outages

PRINCETON, NJ—Generating units have forced outages more frequently during the first week of service of a large coal-fired unit after a "long" scheduled outage than any other time, according to a new report from the North American Electric Reliability Council.

NERC studied records of baseload coal-fired units with capacities of 440 MW or greater to reach this conclusion, which covered the period 1982-1988. The report is called "Generating Unit Availability Following Planned outages."

Specifically, the study showed:

- There is a 47-percent chance such a unit will have its *first* forced outage on the day it returns to service after a planned outage of a week or more.
- If the unit does not see the first-day outage, there is a 5-percent chance it will have a forced outage on the second day.
- There is a 63-percent chance of having a forced outage in this first week.
- About 11.6-percent *of all* forced outages for such units will occur during this first week (see figure).
- Forced Outage Factor will decline significantly with each successive day during the first week after such a planned long outage. (Forced Outage Factor is the ratio of forced outage hours to total hours in a time period.)
- About 60 percent of these forced outages that occur during this first week will last less than a day.

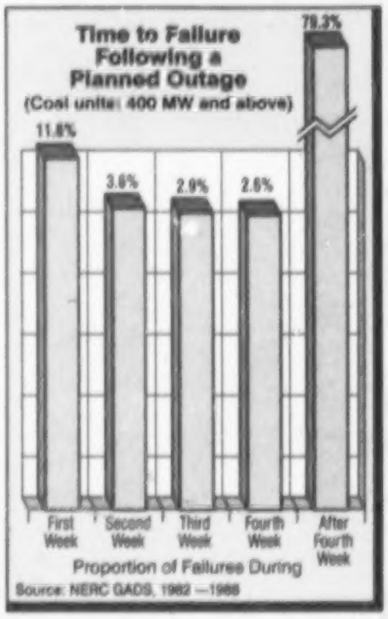
The study reports that the two major contributors to forced outage hours during the *first week* were boiler tube leaks and turbine vibration. The next-most significant contributors were boiler control systems and turbine overspeed-trip test failures.

Yet a turbine problem was the most likely cause when an outage took place on the *first day* (40 percent of the failures). Boiler problems accounted for the next-highest number of first-day failures (31 percent).

After the first week, the failure frequencies essentially reversed. Boiler-related problems were the most significant cause of forced outages in the *entire interval* between planned outages (53.6 percent), while turbine-related causes were next (16.6 percent).

The study was conducted by the Forced Outages Following Scheduled Outages Task Force of NERC's Generating Availability Trend Evaluation Working Group (GATE). Principal data used by GATE was NERC's own Generating Unit Availability Data System (GADS).

The GADS database used for the report covered seven years, 1982-1989, of outage data. The database contained information on 21,406 outages—1,788 planned and 19,618 forced.



Source: NERC GADS, 1982 —1988

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from page 15

Dangerous waste...

for recycling the metals.

They reported at the annual meeting of the American Chemical Society, that they take the hard material that makes up the primary component of the outside of the shellfish, called *chitin*, and make tiny, magnetized *chitosan* beads. The porous beads specifically soak up heavy metals from contaminated water.

The *chitosan* biopolymer is stable and has 100 times more pore volume than flaked *chitosan*, the form it normally is used in for other purposes.

The beads adsorb the metals when just mixed with contaminated water. They then can be easily retrieved with a magnet. They also can later be treated to give up the heavy metals.

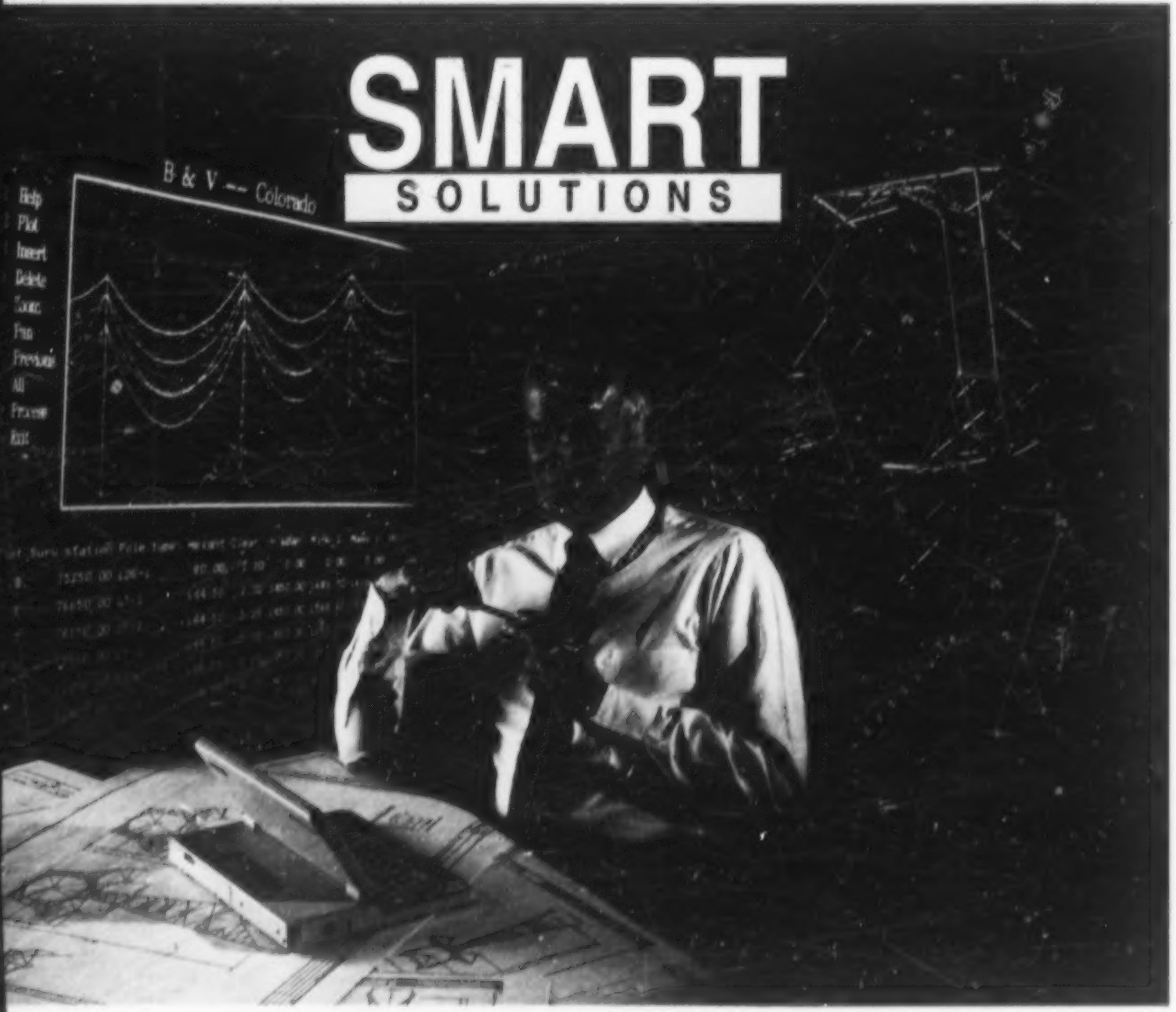
Way said, "They're [the beads] mostly empty space. One gram of this material has about 150 square meters of surface area."

The researchers have used the beads on cadmium in the laboratory, and feel the beads will work on other heavy metals, as well. Rorrer and Way plan field tests in about two years.

Meanwhile, they are exploring other uses for the beads and attempting to optimize the waste adsorption characteristics.

Rorrer noted, "The *chitosan* beads should be cheap and easy to produce. They're environmentally benign, natural, and biodegradable." He also declared, "And they appear to adsorb some heavy metals as well as the best commercial processes now being used."

Way added, "By making our compound magnetic and using special types of fluidized-bed technology, we should be able to manipulate and release the captured heavy metals from the chitosan." That way, the beads could be reused repeatedly and also could create a concentrated heavy metal stream to recover some of the valuable materials.



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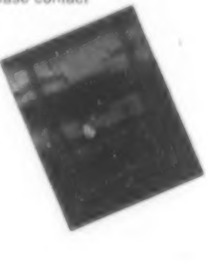

Next generation nuclear plants—innovative, but facing opposition

Henry Stein
Senior Editor-Power Production

With promising advances in new initiatives, hopes are high for an upcoming resurgence in interest and acceptance of nuclear-powered electrical generation in the United States. It never faded in countries such as France, where more than 72 percent of the nation's 1991 electric power was nuclear-generated. And Japan is leading the way in building both new nuclear plants and new types of nuclear plants.

But a number of strong obstacles still stand in the way before a resurgence can begin in the U.S. Various groups have plans to overcome these obstacles.

Standardization, safety

"The commission has long sought nuclear power plant standardization, and the enhanced safety and more predictable licensing regime which standardization could make possible."—Ivan Selin, chairman, U.S. Nuclear Regulatory Commission, addressing the American Nuclear Energy Council at its 18th Annual Nuclear Power Assembly, May 1992.

By standardizing plant designs and construction, the Nuclear Regulatory Commission (NRC) and nuclear industry hope to keep costs down to the point where nuclear units are economically competitive with other popular types of generating power.

"The NRC expects that the next generation of nuclear power plants will be significantly safer than the already existing...designs. The new designs will be simpler, more tolerant of human error, more easily maintained, and less dependent upon active human or mechanical intervention to maintain normal operation."—NRC Commissioner Forrest J. Remick at the dedication of the Penn State University Breazeale Reactor, May 1992.

No emissions

"Nuclear plants produce no airborne emissions, no sulfur oxides, no nitrogen oxides, no particulate matter, and no greenhouse gases."—Sherwood H. Smith Jr., chairman, president and CEO of Carolina Power & Light Co., and chairman of the Nuclear Power Oversight Committee, writing in the Forum for Applied Research & Public Policy, winter 1991.

Costs

The U.S. Council for Energy Awareness (USCEA) stated in July that the cost of building and running a 600-MW reactor over 30 years would add up to 4.5/kWh (in 1990 dollars). USCEA also said that the cost for the larger 1200-MW plants would be about 4.3/kWh. These estimates, if they prove out, would place nuclear power plants as direct economic competitors with pulverized-coal and gas-fired power plants. Subsequently, some of the vendors estimated even lower costs from their new designs.

Among the assumptions used in the USCEA analysis were: approval of the revised licensing process by Congress; certification of standardized plant designs under 10 CFR Part 52; and improved performance leading to capacity factors in the 80-percent range. (Currently, nuclear capacity factors are in the 70-percent range.)

Delays

However, in late June, Chairman Selin said although standardization and licensing reform were making progress, the stalemate in developing a high-level waste-disposal site was the largest impediment to building the new reactors. Congress gave the Department of Energy (DOE) the go-ahead to perform scientific studies of areas for a permanent high-level waste storage facility in 1987. But state officials and environmentalists opposed the Yucca Mountain, NV, site chosen and have delayed the studies.

The new, simpler licensing procedures of 10 CFR Part 45 announced by the NRC in April of '89 will have to be approved, too, in order for utilities to become interested in building nuclear power plants. The revised procedures would allow the NRC to preapprove both the proposed sites and the standardized plant designs, greatly shortening the design/build time period.

Focus On New Nuclear Technology

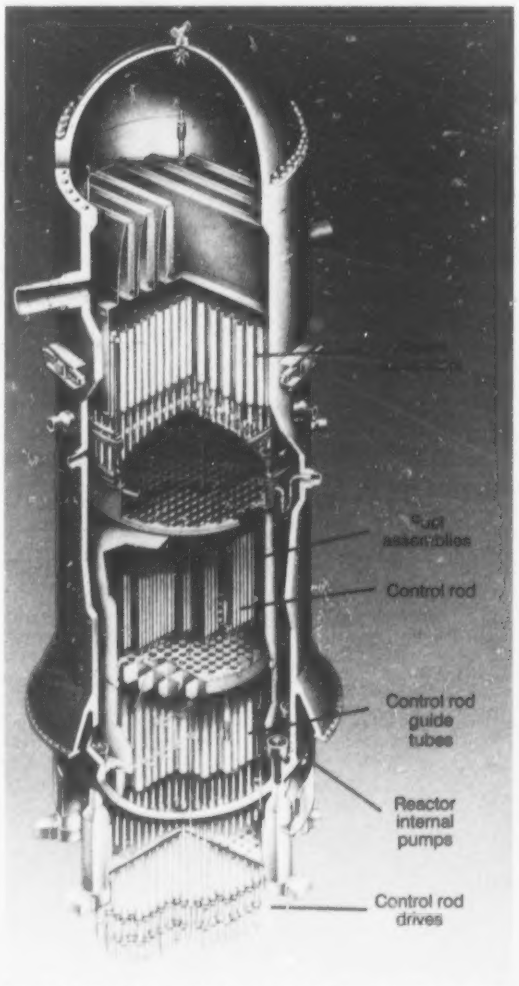

Figure 1. GE's ABWR is first in line for NRC certification, but the process has hit delays

A builder could match site and design, and have them approved prior to applying for a combined construction permit/operating license. After a public hearing, the NRC could issue the combined license. These steps would substantially reduce construction time and capital costs.

However, the new procedures must be passed by Congress and upheld by the courts before they can become effective.

Another governmental problem involves rate setting. An investor-owned utility planning a nuclear plant would need assurances from the state regulatory commission that the rates set would be sufficient to offset the financial risks of a nuclear plant's construction. According to Smith, since 1984, more than $15 billion in such costs have been disallowed.

Taking big chances

The Nuclear Power Oversight Committee (NPOC) published "A Strategic Plan for Building New Nuclear Power Plants." This nuclear industry group's plan committed the industry to specific tasks for achieving that first plant order in '95.

In its late-'91 update for the plan, however, NPOC noted the delay thrown in by "inability to secure final agreement with the U.S. Nuclear Regulatory Commission on design-related issues."

An association of utilities, the Advanced Reactor Corp. (ARC), signed an agreement with DOE on Feb. 18, 1992, to cooperate in jointly funding advanced light-water reactors (ALWRs). DOE-ARC's aim is to complete designs to the point of commercial standardization. Hopefully, this will result in new plant order by 1995, one of the objectives of President Bush's National Energy Strategy. Cost is to be $200 million over five years, shared equally by DOE and ARC.

Matching funds

The nuclear industry's $100 million in matching funds is to come half from utilities and half from its vendors. NPOC announced a firm commitment for its $50-million share on Nov. 11, 1991, and said it had almost 90 percent of the money already pledged. By early August, all the utility and vendor money had been pledged. And on Aug. 14, ARC issued a formal request for proposals to three manufacturers developing the next-generation reactor designs—ABB Combustion Engineering, General Electric Nuclear Energy, and Westinghouse Electric Corp.

The main goals of the program are:

- Complete engineering designs for the ALWRs in sufficient detail to define firm cost estimates, prepare for construction, and support commercial standardization.
- Ensure that an institutional infrastructure is in place to provide resources and manage completion of detailed designs.
- Define the process for achieving commercial standardization.

Contrary views

Yet a committee formed by Congressional request at the National Research Council evaluated seven designs that had been proposed for the "next-generation" reactors and did not recommend quite the same agenda as the government and industry were following.

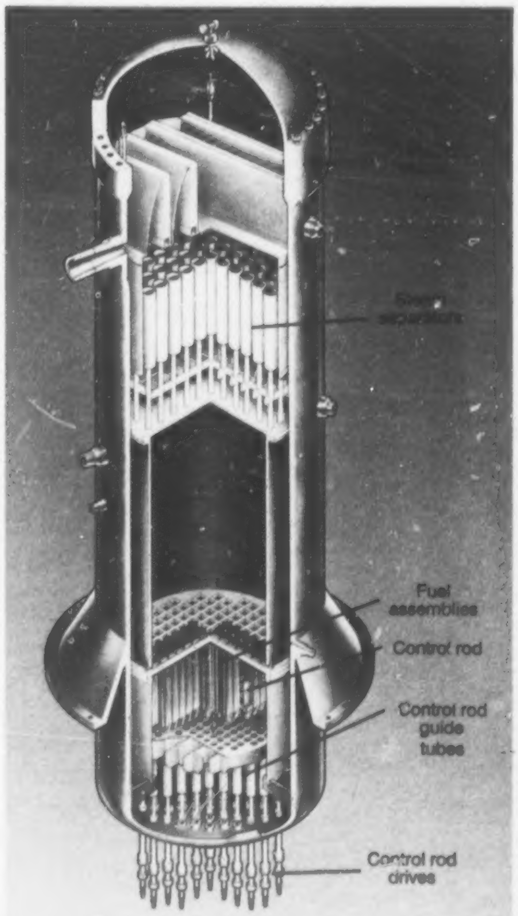

Figure 2. GE's SBWR is very similar to the ABWR, but the SBWR features passive safety systems

In June the committee said the large, evolutionary, light-water reactors should get no federal funding, except for some "incentives" that possibly might help speed their deployment.

It did recommend federal funding for two of the designs—the midsized, light-water reactor with passive safety features and a liquid-metal reactor. The committee also recommended dropping or not considering any spending of government money for the Modular High-Temperature Gas-Cooled Reactor, safe integral reactor, Canadian CANDU-3, and Swedish pressurized light-water reactor.

Continued on page 20

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Next generation...

Comparison of Next-Generation Reactors

Reactor Name	Size (MWe)	Type	Fuel	Moderator	Control Rods	Load-Following Range	Construction Cost ($/kW)	Production Cost (¢/kWh)	Status	Developer
Advanced Boiling Water Reactor	1350	Boiling Water	Enriched UO_2	Deionized Water	B_4C	50-100%	$1,400	1.3¢	NRC certification planned for Dec. 1992	GE Nuclear Energy
Simplified Boiling Water Reactor	600	Boiling Water	Enriched UO_2	Deionized Water	B_4C	50-100%	$1,700	1.8¢	NRC certification expected late 1994	GE Nuclear Energy
System 80+	1300	Pressurized Water	Enriched UO_2	Deionized Water	B_4C and Inconel 625	50-100%	$1,350	3.8¢	NCR design approval due Nov. 1993 Certification due May 1995	ABB-Combustion Engineering
AP-600	600	Pressurized Water	Enriched UO_2	Deionized Water	Ag-In-Cd	50-100%	$1,700	3.9-4.2¢	NCR certification due mid-1996	Westinghouse Electric
CANDU-3	450	Pressurized Water	Natural UO_2	Heavy Water	Cd-Stainless Steel	60-100%	$2,000	2.5-4.0¢	Expect 1st unit ready for service 1999	AECL Technologies
N4	1400	Pressurized Water	Enriched UO_2	Deionized Water	B_4C	30-100%	*	*	Commissioning 1st unit expected 1996	Electricité de France

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The council committee also felt the large, evolutionary LWRs would be the least costly to build and operate; the midsized LWRs with passive safety, the next most expensive; and the high-temperature gas-cooled and liquid-metal reactors, the most expensive.

An even stronger stand was taken by the Union of Concerned Scientists, a Washington-based advocacy group. The Union's July 17 report strongly disputes the safety claims for the new-generation reactors. The report even says the vendors and federal government lack the technical information necessary to make confident and accurate predictions about safety and risk characteristics of the new designs.

To narrow the job down, however, the report concentrates on three designs—the AP600, Modular High-Temperature Gas-Cooled Reactor (MHTGCR), and Power Reactor Inherently Safe Module (PRISM). However, the AP600 is one of the advanced reactors scheduled for later certification, and the MHTGCR and PRISM are still in early stages of design.

The report attacks the new site permit, certification, and licensing process promulgated by the NRC in 1989, presenting many reasons why the Union feels the process falls short. The main objection is to the combined licensing process and the way it "severely limits" public participation.

The Union also strongly objects to the terms and concepts of "inherent safety" and "passive" system, and whether they will work.

Design classes

The four U.S. nuclear power-producing designs being actively pursued that are nearing NRC certification are all ALWRs but can be divided into two classes. The first includes the large, evolutionary reactors exemplified by the GE Advanced Boiling Water Reactor (ABWR) and the Asea Brown Boveri-Combustion Engineering System 80+. These two are 1300-MWe-range units that still use active emergency systems.

The second class includes the more revolutionary, midsized reactors exemplified by the GE Simplified Boiling Water Reactor (SBWR) and Westinghouse AP-600. These two are 600-MWe units that use passive safety systems.

All four ALWRs rely more on automatic safety systems, rather than operators, to maintain safe operation if the cooling water flow to the core is interrupted.

The evolutionary reactors, compared to their predecessors, are designed with greater safety margins, and for simpler construction, improved maintainability, lower operating costs, and easier operation.

The other reactors discussed here fall into completely separate classes. The CANDU is a reactor that uses heavy water (deuterium oxide) as coolant and moderator. The modular high-temperature gas-cooled reactor uses a gas to cool the core and graphite as the moderator. The liquid-metal reactor uses liquid sodium as the coolant and is a fast-neutron reactor.

ABWR

GE Nuclear Energy's 1350-MWe Advanced Boiling Water Reactor is the first ALWR being deployed commercially and first in line for NRC certification (see Fig. 1).

The ABWR was to be given design approval by the end of this year. But NRC staffers were still raising questions as of this writing. Consequently, there are doubts that they would finish work on a final safety evaluation report by August. So the NRC may not have enough time to decide on approval of the design by the early December time originally set. Questions were raised about the ABWR's control and instrumentation, piping supports, and radiation protection.

Since this is the first of the next-generation nuclear reactors to be considered for NRC certification, delays in its approval will probably cause backups that will hold up certification of the other three designs.

Not waiting for the U.S., Tokyo Electric Power Co. (TEPCO) started construction for the first unit of the first-ever ABWR at Kashiwazaki-Kariwa station 140 miles northeast of Tokyo in Sept. 1991. The 1350-MWe unit is scheduled to go into commercial operation in 1996. TEPCO's Unit 2, also 1350 MWe, began construction in Feb. 1992, with commercial operation slated for 1997.

GE is to supply the nuclear steam supply systems, fuel, and turbine generators. Other systems will be provided by Japan's Hitachi Ltd. and Toshiba Corp. The Japanese project is serving as a proving ground for advanced-design, light-water technology.

Key features of the ABWR are: passive severe-accident mitigation capabilities; recirculation pumps internal to the reactor; fine-motion control-rod drives; digital controls and instrumentation with multiplexed fiber-optic cabling; modular construction; inerted pressure-suppression containment with horizontal vents; and an advanced turbine-generator.

The ABWR and its companion SBWR share a common technology base. The common base includes basic BWR design, state-of-the-art electronics, computer technology, turbine design, and fuel technology. The essential differences are in power rating, core flow recirculation, and the extent to which safety systems rely on active or passive features.

Both the ABWR and SBWR use simplified designs for reactor core flow recirculation. The ABWR has 10 internal pumps for recirculation flow, while the SBWR utilizes natural recirculation that depends on liquid flow that is gravity-induced and temperature-induced.

The ABWR reactor core consists of 872 fuel bundles operating at a power density of 50 kW/liter (kW/l). Fuel rods have a zirconium barrier liner, axial variation of enrichment and gadolinia, no shallow control rods, and no rod pattern exchanges.

Eliminating external recirculation pump piping and using vessel forged rings does away with 50 percent of the welds in the primary system pressure boundary.

The fine-motion control rod drive is designed to reduce periodic maintenance, which also reduces associated occupational exposure. The control blades are moved electrically during normal operation. This feature allows for small power changes and shorter startup times.

Three systems provide for emergency core cooling and residual heat removal. Each of two of the systems provides high-pressure and low-pressure emergency core coolant injection. The third combines a reactor-steam-driven turbine pump for high-pressure coolant injection and a low-pressure coolant-injection system.

Control and instrumentation uses multiplexed signals along fiber-optic networks that work with a

Continued on page 21

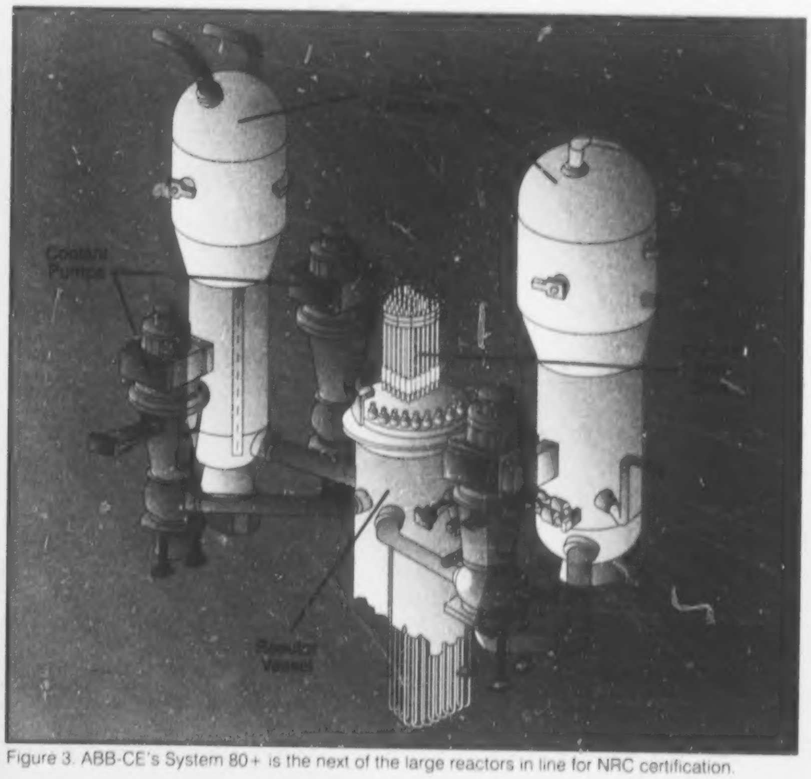

Figure 3. ABB-CE's System 80+ is the next of the large reactors in line for NRC certification.

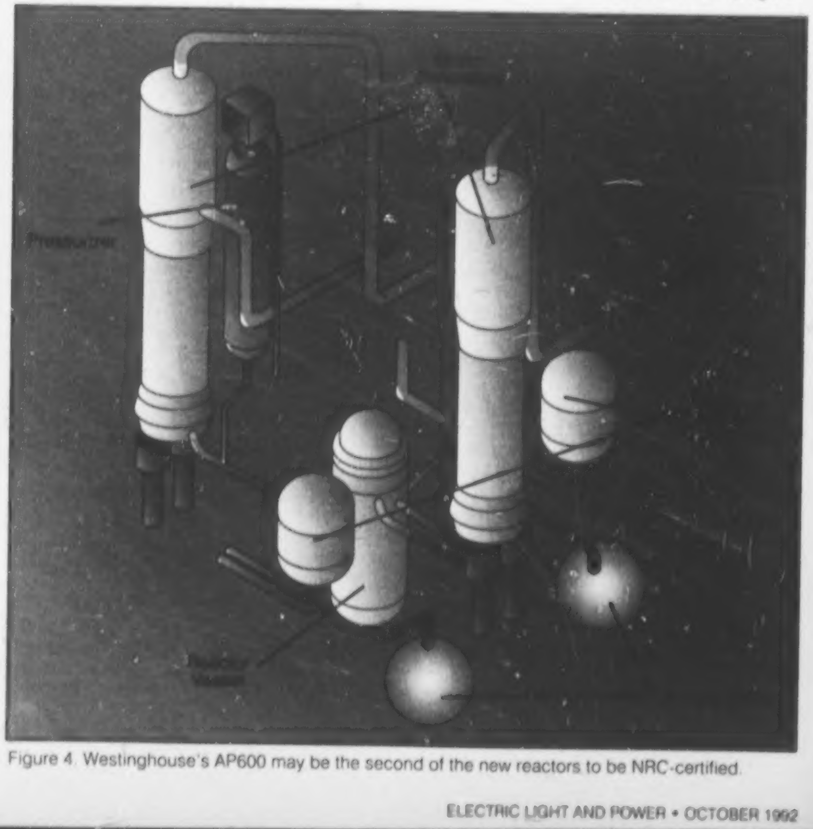

Figure 4. Westinghouse's AP600 may be the second of the new reactors to be NRC-certified.

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Next generation...

digital, solid-state control system. The resulting system increases system redundancy, provides fault-tolerant operation, and performs self-diagnostics while the reactor is operating.

The reactor building is steel-lined reinforced concrete. The reinforced-concrete containment vessel is the pressure-suppression type with a covered suppression pool.

SBWR

GE's 600-MWe Simplified Boiling Water Reactor is a smaller-sized advanced BWR featuring passive safety (see Fig. 2). GE Nuclear began design studies for it in 1982, and received a DOE contract for its continuing work in Sept. 1989. NRC certification is scheduled for late 1994.

The SBWR uses natural coolant circulation, gravity, and stored energy for "passive" safety. In case of an accident, the unit's safety system does not need pumps, traditional heat exchangers, or operator actions to cool the core down.

Its low power density (42 kW/l) gives the SBWR high thermal safety margins. At full power, the reactor operates with natural water circulation, so no recirculation pumps are needed. This reults in a simpler reactor vessel, reduced vulnerability to coolant loss, and reduced maintenance. However, the reactor vessel must be larger to accommodate these features.

The suppression pool is above the reactor core. Thus, in an emergency, gravity-induced flow handles core cooldown, rather than injection pumps. Not only are the injection pumps eliminated, but so are the associated valves, piping, and diesel generator power supplies.

During normal operation, an isolation condenser passively controls reactor pressure. The condenser is located in a pool of water above the core and outside the containment. In the event of loss of coolant, the isolation condenser also can remove long-term, postaccident decay heat from the containment.

As with the ABWR, the SBWR uses a multiplexing system with fiber-optic data transmission, and microprocessor-base controls and instruments. And again, the equipment allows for fault-tolerant operation, fault detection, and self-diagnostics while the unit is operating.

Modular construction techniques are designed to reduce costs and shorten construction to about 30 months. Modularization is planned for reinforcing bar assemblies, structural steel assemblies, steel liners for containment and associated water pools, and some equipment assemblies.

System 80+

ABB-Combustion Engineering had submitted its application for standard design certification of its System 80+ to the NRC as of June (see Fig. 3). Plans called for the 1300-MWe pressurized-water reactor design to be approved by the NRC in Nov. 1993, and NRC certification was expected in 1995.

The design evolved from Combustion Engineering's System 80 nuclear steam supply system and Duke Power's P-81 design. Three of the forerunner System 80 units are operating at Palo Verde nuclear plant, and two are scheduled to be constructed in the Republic of Korea.

The System 80+ core design uses only control rods for reactivity control, which eliminates the need for adjusting boron concentration in the coolant. This simplifies reactivity control during load changes.

Reduced normal System 80+ operating hot-leg temperatures and revised monitoring methods increases core thermal operating margin compared to the System 80. System 80+ steam generators have larger heat transfer areas and reduced full-power steam pressure because of lowered coolant temperatures. The larger heat transfer areas allow for the nuclear steam supply system to maintain rated output even though a number of tubes may be plugged.

The System 80+ has four trains (sources) for emergency feedwater injection. They are used for both low- and high-pressure injection of borated water into the reactor coolant. This design eliminates need for a dedicated low-pressure injection system and its cross-connects with the shutdown cooling system. An in-containment refueling water storage tank eliminates reliance on automatic or manual switchover of suction in case of a break in the primary coolant piping.

Controls and instruments utilize digital processing, fiber-optic data communications, and touch-sensitive video displays. Alarms are prioritized by the system. Control room computers reduce the amount of information presented continuously to the operator, yet allow access to all plant data when desired. Microprocessors continuously analyze and validate information to determine the most accurate readings.

~~The~~ containment structure is a free-standing steel sphere enclosed in a cylindrical concrete shield building. This dual containment structure is designed to withstand severe core damage accidents that are worse than occurred at the Three Mile Island Unit 2.

Many systems and structures are modularized, so construction schedules should be 48 months, and then an additional six months would be needed for startup testing.

AP600

The Westinghouse Electric Corp. AP600 passive PWR final design certification was set for Nov. 1994. Westinghouse Electric Corp. expected to submit its 600-MWe design to NRC before the end of this year (see Fig. 4).

In the meantime, on March 16, the company and NRC signed an agreement for an experimental test program to support design certification for the reactor. The two organizations will share test data from three programs, two in the U.S. and one in Italy.

One of the U.S. tests will be at Oregon State University this fall. Low-pressure integral systems tests will be performed

Continued on page 22

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From page 21

Next generation...

on a one-quarter-scale AP600.

The other, passive-containment cooling-system tests, are being run at the Westinghouse Science & Technology Center near Pittsburgh.

The tests in Italy will be conducted by the state utility ENEL, the Italian regulatory authority ENEA, and the company SOPREN/Ansaldo in 1993. The program will provide baseline data on system interactions at high pressure.

The AP600 uses the proven uranium-oxide-fueled core, but with reduced coolant temperatures, flow rates, and core power density to increase thermal safety margins.

Mounting reactor coolant pumps in the channel head at the bottom of the steam generator simplifies their support system, reduces piping, and increases space available for maintenance.

Passive emergency core cooling is achieved with a combination of gravity drain of water from two core makeup tanks and a refueling water storage tank positioned above the level of the core. Also, two pressurized accumulator tanks can inject water into the core, if necessary.

Core decay heat also can be removed with a natural-circulation heat exchanger in the refueling water storage tank.

Controls and instruments use microprocessor-based technology, multiplexed controls for plant data and signals, electrical data links, and fiber-optic data highways.

Modular construction allows for factory fabrication and assembly in 3-4 years after a construction permit is issued. The simplified modular design should allow for relatively short construction times and low capital costs that could compensate for any lost economies-of-scale.

CANDU-3

The AECL Technologies 450-MWe CANDU-3 (CANadian Deuterium Uranium) is a heavy water-cooled and -moderated reactor to be used in Canada and abroad for power generation. It is a pressurized-water reactor with its fuel in "channels" inside pressure tubes through which flow circulating heavy water coolant.

The pressure tubes are held inside near-atmospheric-pressure "calandria" tubes. The calandria tubes penetrate and pass through the calandria tank containing the heavy water (deuterium) moderator. A shield tank surrounds the calandria tank.

AECL sent a letter of intent to submit the design for certification under 10 CFR Part 52 in 1989. The company is continuing to submit preapplication material to NRC that will lead to a formal application for design certification.

This reactor is the latest and smallest version of the CANDU series. It is highly standardized, as are all in the series. All key CANDU-3 components—steam generators, coolant pumps, pressure tubes, and refueling machines—are identical to those in all other CANDU power plants. However, besides being smaller than the others, the CANDU-3 is highly modularized.

Other CANDU-3 features are: natural uranium oxide fuel; heavy water as moderator and coolant; and online refueling.

Two separate, independent shutdown systems can automatically stop the reaction. The primary system is a set of 24 spring-assisted rods that drop into the reactor by gravity action. The second system injects a neutron-absorbing poison, gadolinium nitrate, into the low-pressure moderator. Gas-filled tanks force the fluid into the moderator.

The emergency core cooling system provides for both short-term injection from pressurized accumulator tanks and long-term recirculation of a mix of normal and heavy water. The reactor has a positive void coefficient during a large loss-of-coolant accident that can produce a power rise of 50-100 percent per second. This rise must be counteracted by one of the two independent shutdown systems.

CANDU reactors use digital computers for control of the reactor regulating systems and other process systems (such as pressurizer and steam boiler level). However, the CANDU-3 introduced a distributed control system to replace the two large central computers used on its forerunners. The distributed system is linked by coaxial cable data highways.

Modular construction can be used for the CANDU-3. Contents of each station building are suvdivided into modules on a system and subsystem basis. Modules and standard interfaces between them facilitate site assembly and minimize construction time. For instance, fuel channels and steel calandria can be factory assembled.

A reinforced-concrete containment building surrounds the reactor and steam generator units.

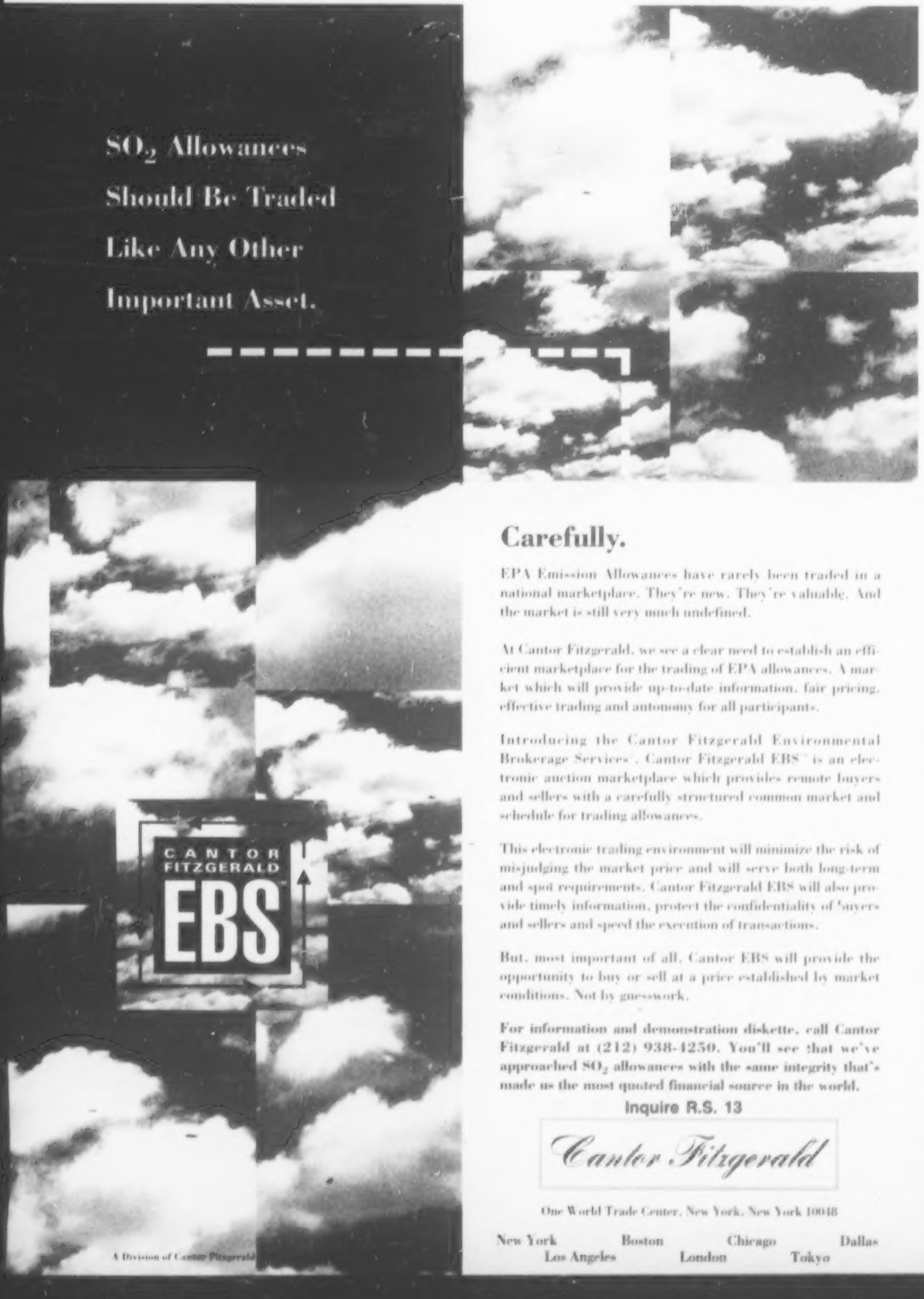
N4

The Electricité de France 1400-MWe N4 reactor uses 205 fuel elements, four steam loops, and five groupings of control rods. It is designed to load-follow at up to 5 percent of maximum power per minute.

The Arabelle impulse turbine was specially developed by Alsthom for this reactor. Although turning out an increase of 100 MWe over the previous model turbine, the Arabelle is 10-percent shorter, weighs 15-percent less, and is 1.5-percent more efficient.

The new alloy for steam generator tubes is Inconel 690, which is designed to improve corrosion resistance and reduce exposure of operators to radiation during maintenance due to its low nickel and cobalt release rate.

The control room features wide-scale integration of control and data displays. In all circumstances except emergency situations, control is performed solely with these computerized control and data display facilities. Conventional equipment is limited to emergency controls and some information about main control parameters.



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Dielectric tester saves $4400 per yr

ROCK ISLAND, IL—A computerized oil-testing system has enabled Iowa-Illinois Gas and Electric Co. to test 800 samples of oil annually at a savings of $4400.

The system has a rotating turntable capable of holding 24 sample containers. A probe assembly on a linear actuator tests each sample until breakdown. The dielectric strength is read and printed by a PC equipped with a single-channel analog data-acquisition board and a 16-channel digital-control board—both manufactured by Real Time Devices, State College, PA.

The dielectric strength is read by measuring a millivolt metering signal from a Hipotronics power supply.

The software for the program is written in GWBASIC and permits the operator to enter the number of samples to be tested and the number of tests to be performed on each sample.

A two-part label is used to report the test results. The labels are printed by a PC containing maintenance records of all oil-filled equipment. The labels are sent to the field to be placed on the sample jar before the sample is taken from the device. After testing, a label is placed adjacent to the test record.

The automated system has produced substantial cost savings over the previous manual-testing system and has standardized test proecedures that yield more consistent test results.

SCADA/EMS spending rebounds

ROSEVILLE, CA—Electric utilities plan to spend more than $667.7 million on supervisory control and data acquisition systems (SCADA) and energy management systems (EMS) during the 30-month period from July 1992-January 1995, according to CSR Inc.'s survey of 1462 utilities. In addition, another $137.6 million will be spent on peripherals and consulting:

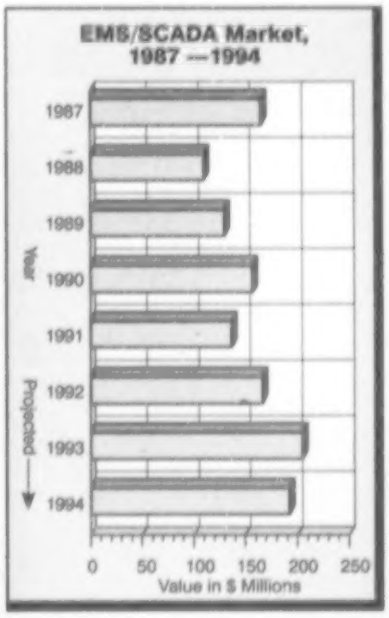
Type of Project	# of Projects	$(10^3)
Systems	385	667,674
RTU Add-On	243	64,720
Consulting	95	4,755
Mapboard	103	7,057
Communications	196	61,115

The SCADA/EMS market was $165 million in 1987 and dropped the following year to $110 (see Figure). The market rebounded strongly in the next two years but fell in 1991 to $137 million.

The 3-year projections for 1992-94 show a strong market. CSR's method of tracking shows that, in the 12-month period following the annual study, between 58 and 62 percent of the systems market plans will actually be awarded. The rest will be delayed or, in some cases, cancelled.

CSR says that national and international economies can cause an unpredictable recession or expansion. The recent recession has had a depressing effect on the 1991 and 1992 contract awards. CSR expects the 1993 awards will be back on the normal track.

The study lists the total dollar amounts by company and the number of projects by company.



Plant research may help clear rights-of-way

HAGERSTOWN, MD—Allegheny Power System and the International Society of Arborculture Research Trust will seek ways to control the rising costs of right-of-way maintenance in a five-year research project.

APS spent $32 million last year on such maintenance.

Michael Watson, Potomac Edison Co.'s supervisor of forestry, helped develop the agreement which covers nine projects, including wood chip disposal; genetic engineering of plants; and ecological succession and allelopathic relationships of plant communities. (Some plants control competitors' growth with toxin releases.)

Other projects are a herbicide injection system; mechanical clearing equipment; cultivated street trees; debris vacuum; slide library of low-growing trees; and lightweight, portable tree climbing systems.

Priority list

"We hope that our involvement will stimulate utilities, manufacturers and others to get involved to increase the scope of the research," says Watson.

"Vegetation control research is not high on the utility industry's R&D priority list, which is surprising considering how much money is spent and the impact on customer relations," he adds.

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Prudent avoidance works best for Denver in EMF case

Lawrence E. Powell
Edwin J. Johnson

The judge at Denver's City and County Building discovered significant, 60-Hz electromagnetic fields (EMF) when he installed a personal computer in his chambers.

Only unreadable "garbage" appeared on the video display. When the system was moved to an adjoining room, the "noise" would disappear even though still powered by a long extension cord from the original receptacle.

Building maintenance personnel recalled that the service lateral (¼ x 6-in., open bus bars) passed directly beneath the floor of the judge's chambers.

Personnel from the Public Service Company of Colorado (PSC) were summoned to "map" the field strength levels in the judge's chambers and adjacent offices to confirm suspicions.

An Electric Power Research Institute STAR gaussmeter mounted on a frame measured the field strength 30 in. above the floor. A measuring wheel automatically accumulated the distance traveled from the starting point.

The three-coil meter reads the "resultant" of the field strengths in the x-y-z planes. The route traveled passed over the bus bars several times as the instrument was routed around office furniture.

As was discovered later, the readings in the 400-500 milligauss range (which occurred near the beginning of the measurement route) were being created by fields emanating from yet another source—unconfined cables which added to the fields being generated from the open bus bars.

Possible solutions

Stone and Webster Engineering Corp., was given the assignment of developing possible solutions for reducing EMF. With assistance from technicians from PSC, a series of experiments were investigated including:

- The bus bars were originally protected by a sheet-metal shroud on three sides, but were unprotected on the top. A sheet of metal was carefully maneuvered over the bus bars to create a complete, metallic enclosure around the bars thereby providing a short-circuit (or at least a lower-reluctance path) for the induced fields. Surprisingly, measurements within the judge's chambers revealed little attenuation.
- Next, two, ¼-in. thick, steel plates, four ft^2 were placed directly over the bus bars on the floor of the judge's office. The result was deformation of the fields but no attenuation in the areas of interest.
- The plates were then grounded by a heavy welding cable to a nearby cold-water pipe resulting in only a slight attenuation over the initial, ungrounded configuration.

Up to this point, effort was being concentrated on fields emanating from the open bus bars. We began to suspect that other sources of high EMF might exist. Using a single-coil gaussmeter (Electric Field Measurement Co., Model 112 Dinometer, other room surfaces were explored. Along the north wall, which separates the judge's office from the transformer vault, readings in the order of two gauss were recorded near the floor.

A tour of the interior of the transformer vault revealed the source of these high levels. From the collector buses over the three, 1000-kVA network transformers, sixteen parallel runs of four, 500-MCM cables (eight parallel runs to each switchboard bus) were bundled on a cable tray attached to the wall. These cable groups were right at floor level of the judge's office and parallel to the long dimension of the room. Readings as high as nine gauss were registered in the immediate vicinity of the cable groups within the transformer room.

Stone and Webster considered several alternatives for confining the fields from the cable groups and the open bus bars. None appeared to offer real promise and most would have involved inordinate costs or lengthy outages for the facility—situations which were unacceptable.

The problem was discussed with Frank Barnes, professor, Electrical and Computer Engineering Department, University of Colorado—an acknowledged expert on EMF.

Experiments by Barnes and Jackson Fuller, retired professor of electrical engineering at CU, revealed that EMF could be reduced in the order of 100 to 1 around wire in free air and wire confined in steel conduit.

Stone and Webster conceived a re-design of the service lateral into the City and County Building which involved eliminating the open bus bars and replacing them with cable in conduit. The three phase conductors and full-sized neutral in each conduit would be "twisted" (transposed) as they were pulled into the conduit, creating an even further cancellation of EMF.

The conduits were to be routed as far away as possible from the judge's desk to gain advantages of attenuation with distance. Finally, the conduits would be terminated at the switchgear (top fed) in heavy, steel enclosures to further confine fields at the terminus of the conductors.

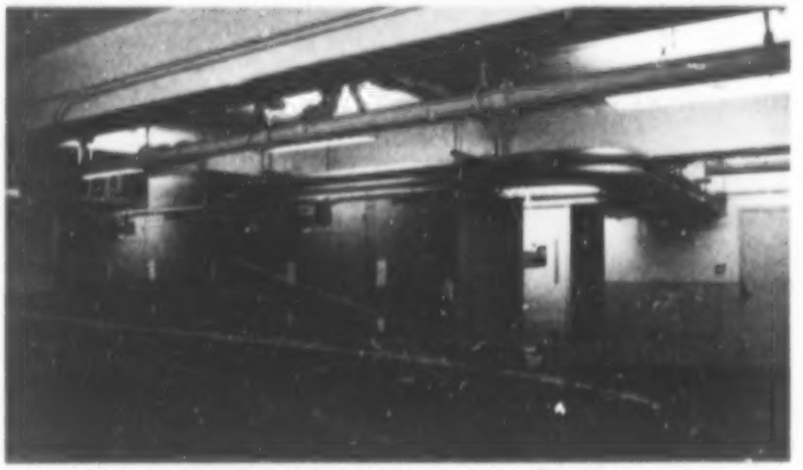
Beginning at 6:00 PM on a Friday evening, all power was removed. Critical circuits were powered by an emergency generator which also provided construction power.

Busbars between the transformer vault and switchboard were removed and busbar extensions were fabricated and drilled for 88 terminations. These extensions were made to match the original bolt pattern in the switchboard buses, thus preserving the "original configuration" of the switchboards as "U.L. labeled" at the factory.

Some 88 cable terminations and splices were made at both the switchboards and the transformer vault. PSC's metering instrument transformers were relocated, reconnected and recalibrated.

The three, remaining sides of the heavy, steel "top hats" were placed and secured and the fire rating of the wall between the switchgear room and the transformer vault was re-established by closing the former openings for the bus bars.

Some 44 hr later, normal power was restored to the facility without any unfavorable incidents. After all modification activities were completed, another EMF strength map showed dramatic reductions. The high point, again, appears near the beginning of the measurement route—undoubtedly because of its proximity to the collector buses in the transformer vault and the 88, unconfined "pigtails".



Each switchboard accomodates 11 conduits and a "top hat" above. The adjacent transformer vault houses 88 cable terminations. The new arrangement virtually eliminated the EMF problem.

Lessons learned

Several lessons were learned and several design considerations surfaced during this case study including:

- Extra-low-frequency (ELF) electromagnetic fields, of levels capable of causing erratic performance in electronic equipment, will exist in an office environment where high-current levels exist.
- Such fields can be significantly reduced without resorting to the use of expensive, high-permeability alloys.
- Routing of poorly shielded bus bars or open cables (as is commonly employed in cable tray installations) should be carefully located in relationship to areas occupied by people or sensitive electronic equipment.
- The effects of electromagnetic fields is often fraught with emotional concerns while being studied by the scientific community.

Though external, EMF were attenuated successfully, introduction of equipment which generates extra-low-frequency (ELF) electromagnetic fields within the "conditioned" space will, itself, become a source of concern.

Best practice

Until the scientific community is able to "quantify" levels and durations of exposures which are not injurious to human health, the policy of "prudent avoidance" is, perhaps, the best practice for electrical distribution systems in commercial buildings. Prudent avoidance is defined as taking those actions which can reasonably be accomplished to mitigate the effects of extra-low-frequency electromagnetic fields whether they be accomplished by shielding or distance.

DA/LM spending holds steady

ROSEVILLE, CA—U.S. and Canadian utilities will spend $326.8 million on distribution automation (DA) and load management (LM) systems in the 30-month period from July, 1992-January, 1995, according to market researcher CSR Inc.'s latest study.

A decrease in spending for DA projects from $81,595,000 in 1991 to $63,622,000 in 1922 was offset by a dramatic rise in remote terminal unit (RTU) add-on projects from last year's figures.

Plans for design, development, and purchase of a new or upgraded DA and LM systems include:

Project Type	# of Projects	$ (000)
DA	182	$63,637
RTU Add-On	76	60,292
LM	126	87,816
Switch Add-On	176	115,031

CSR's survey of 1462 utilities also found an increase in the number of switches being purchased for both LM and switch add-on projects indicating an increased interest in demand-side management.

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